MARINE REVIEW

Entered at Cleveland Post Office as Second-class Mail Matter.

VOL. XXII. Published every Thursday at 418-19 Perry-Payne Bldg., by the Marine Review Pub. Co. CLEVELAND, O., OCT. 11, 1900. Subscription $3.00 a year. Foreign $4.50 a year. No. 15

DULL CLOSING OF LAKE NAVIGATION.

SHIPS HAVE MADE MONEY ON CONTRACTS OF LAST WINTER AND WILL NOT TAKE CHANCES ON LOW FREIGHTS—SPECULATION AS TO TOTAL ORE OUTPUT.

Unless a decided change occurs as regards the movement of grain from the northwest, the month of November will certainly be a very dull month in lake navigation. The great bulk of the lake fleet is engaged in carrying iron ore on the high basis of freights established by the contracts of last winter. Nearly all of these contracts expire with the first of November. Ore shippers are predicting a big falling off in the November movement compared with previous years, and there is every reason to expect that they are right, on account of the present condition of the iron and steel industry as compared with the boom that was on when the lake freight contracts were made. It is not now expected that there will be grain sufficient to take the place of restricted ore shipments in November, and therefore the prospects of a dull and early closing of navigation. The vessel owners who have made money on contract ore will not be disposed to keep their ships running on low freights late into the fall. They will certainly make no trips that do not offer an assurance of profit. This condition would be very unfavorable to shippers of bituminous coal if they were behind on their calculations as to the movement of coal. If freights on down-bound trips were not sufficient to attract the vessels, it would be necessary to bid up coal rates. Most of the shippers claim, however, that they are well up to expectations in their shipments, notwithstanding a shortage of cars during the past few weeks.

Hard coal shipments are, of course, short of other years on account of the strike of miners. On the first of the present month hard coal shipments out of Buffalo were 315,000 tons less than on the same date last season. Practically no coal has been moved out of Buffalo since the first of the month. The cargoes all told would probably not aggregate 10,000 tons. But the volume of hard coal moved by lake is now so small as compared with ore, coal and grain, that a shortage does not usually affect the general situation. Hard coal shipments by lake have in fact shown no increase in recent years. The railroads, on account of the advantages of all-rail delivery, have been adding to their share of the business each year. Rail shipments of hard coal to Chicago are more than double the lake shipments. Buffalo's record year in lake shipments of hard coal was 1887 when 2,800,000 tons were shipped. That figure was not reached again until last season when the shipments were again 2,800,000 tons, but this was due largely to the car famine. The coal went by lake on account of the shortage of cars and not on account of a regular increase in the lake movement.

The fact that iron ore shipments last month exceeded the shipments of September, 1899, has again caused speculation as to the total output of the Lake Superior region this year. Last year the total, including 350,446 tons of rail shipments, was 18,251,804 tons. If the pace of the early part of the season had kept up the total would very probably have been 20,000,000 tons, and it is even yet probable that more than 19,000,000 tons will be produced. As shown by the accompanying table, the shipments

IRON ORE OUTPUT, LAKE SUPERIOR REGION,

Months.	1900 Gross tons.	1899 Gross tons.
April and May	3,265,888	2,125,061
June	3,149,952	2,628,895
July	3,038,560	2,902,867
August	2,911,622	3,013,645
September	2,519,043	2,374,406
Total to Oct. 1	14,885,065	13,044,874

to Oct. 1 aggregate 14,885,065 tons, compared with 13,044,874 tons on the same date in 1899. In October of last year the shipments were 2,543,859 tons, and in November and December, 2,301,424 tons, or a total of 4,845,283 tons. Add this to the present total of 14,885,065 tons and we have 19,730,348 tons as a possible output for 1900, but of course it is not expected that shipments for the balance of the season will be equal to the October and November movement of a year ago, and it is therefore more reasonable to expect that the final figures may be even a little short of 19,000,000 tons.

Secretary Long has completed his estimates for the expenses of the navy during the fiscal year ending June 30, 1901, and notwithstanding his vigorous pruning of the recommendations of his chiefs of bureaus he is unable to reduce them below $75,000,000. None but absolutely necessary works are provided for in the estimates. The estimate for increase of the navy is large, but it is not excessive in view of the number of ships under construction and projected. It amounts to a little more than $21,000,000. It is not considered likely that the secretary in his forthcoming report will recommend the authorization of more ironclads, though it is believed he will urge the construction of twelve gunboats of about 900 tons, sheathed and coppered, for service in the Philippines.

When the American Ship Building Co. (consolidated yards of the great lakes) gives an order these days for windlasses, pumps or other auxiliary machinery it is worth looking after. The American Ship Windlass Co. of Providence, R. I., has just made arrangements with the consolidation to furnish twenty-one No. 8 steam capstan windlasses to handle 1⅞-in. chain, two No. 6 steam capstan windlasses to handle 1⅝-in. chain, twenty-one steam capstans of various sizes and two No. 2 steam towing machines. Such an order as this is certainly the strongest kind of an endorsement of the machines made by the Providence company.

LAKE SUPERIOR COMMERCE.

TOTAL TO OCTOBER 1 IS PRACTICALLY 20,000,000 TONS—GAIN IS IN IRON ORE AND SOFT COAL—LESS WHEAT AND LESS FLOUR.

Probably the most interesting features of canal reports from Sault Ste. Marie regarding Lake Superior commerce are the figures dealing with the coal movement. Hard coal shipments are, of course, less than they were a year ago, on account of the miners' strike. The total to Oct. 1 is only 422,375 net tons, against 565,301 tons on Oct. 1 a year ago. September shipments of soft coal were 114,251 tons less than in August, but the aggregate to Oct. 1 is 3,178,113 tons, against 2,202,321 tons on Oct. 1, 1899, and 2,550,452 tons on Oct. 1, 1898.

Notwithstanding the voluntary idleness of most vessels of one of the large lake fleets, and the small amount of business that is offered aside from contract vesels, the total movement of freight of all kinds to and from Lake Superior to Oct. 1 is very close to 20,000,000 tons. To be exact, it is 19,901,473 tons, against 15,477,876 tons on Oct. 1, 1899, and 15,081,528 tons in 1898. The principal gain, of course, is in iron ore and soft coal. The movement of wheat is only 2,000,000 bushels less than it was Oct. 1, 1899, but at this time a year ago the shipments of grain other than wheat footed up 18,422,016 bushels, while the total now is only 8,421,640 bushels. Flour shipments are also short of what they were in 1899—about 400,000 barrels. Full summaries of the canal reports follow:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To Oct. 1, 1900.	To Oct. 1, 1899.	To Oct. 1, 1898.
Coal, anthracite, net tons	422,375	565,301	352,668
Coal, bituminous, net tons	3,178,113	2,202,321	2,550,452
Iron ore, net tons	13,102,470	11,095,316	9,434,493
Wheat, bushels	31,294,217	33,211,799	21,414,527
Flour, barrels	4,341,946	4,752,717	4,541,807

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO OCTOBER 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To Oct 1, 1900.	To Oct. 1, 1899.	To Oct. 1, 1898.
Copper	Net tons	95,518	80,613	87,938
Grain, other than wheat	Bushels	8,421,640	18,422,016	16,641,400
Building stone	Net tons	26,759	21,034	4,670
Flour	Barrels	4,341,734	4,751,142	4,540,880
Iron ore	Net tons	13,102,470	11,095,316	9,434,493
Iron, pig	Net tons	15,069	19,556	26,165
Lumber	M. ft. b. m.	624,645	735,389	660,488
Silver ore	Net tons	110	.....	.....
Wheat	Bushels	31,294,217	33,211,799	21,414,527
Unclassified freight	Net tons	49,725	99,352	174,122
Passengers	Number	25,778	21,586	18,435

WEST BOUND.

Coal, anthracite	Net tons	422,375	565,301	352,668
Coal, bituminous	Net tons	3,178,113	2,202,321	2,550,452
Flour	Barrels	212	1,575	927
Grain	Bushels	21,984	38,500	19,205
Manufactured iron	Net tons	97,317	128,339	166,242
Salt	Barrels	200,456	242,837	199,755
Unclassified freight	Net tons	294,079	298,521	278,159
Passengers	Number	26,445	23,665	21,920

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Oct. 1, 1900.	To Oct. 1, 1899.	To Oct. 1, 1898.
West bound freight of all kinds, net tons	4,020,388	3,222,167	3,376,146
East bound freight of all kinds, net tons	15,881,085	12,255,709	11,705,382
	19,901,473	15,477,876	15,081,528

	Vessel passages.	Registered tons.
To Oct. 1, 1900	14,919	17,366,783
To Oct. 1, 1899	14,544	15,574,263
To Oct. 1, 1898	13,486	13,777,982

It has been decided finally by the navy department to retain the flagship New York in commission. It was thought she might have to be laid up at the New York yard for general overhauling, but this will be deferred until next spring.

GERMAN ARMORED CRUISER PRINZ HEINRICH.

The Prinz Heinrich—at present completing for sea—is apparently intended as a standard type for German armored cruisers. Unlike the Fürst Bismark, she is not a merely weak battleship, but a cruiser pure and simple, built chiefly with an eye to cruiser work. Her principal dimensions, etc., are as follows:

Displacement	8868 tons.
Length	394 ft.
Beam	65½ ft.
Draught (mean)	23¾ ft.
Armament	Two 9.4 in. (24 cm.)
"	Ten 6-in. (15 cm.)
"	Ten 1-pounders.
"	Four Maxims.
Torpedo tubes	One bow, submerged.
" "	Two broadside, submerged.
" "	One, stern, above water.

The armor is distributed as follows: There is a complete water-line belt of Krupp armor 4 in. to 3 in. in thickness, reinforced by a protective deck 2¾ in. thick on the slopes. Above the belt there is a redoubt about 165 ft. long, and of about the same thickness as the belt. Above this again is the main deck redoubt, 6 in. thick, in which six of the 6 in. guns are mounted. Both redoubts have 6 in. bulkheads, while screens will be placed between the guns in the upper one. On top of the upper redoubts there will be four turrets, oval in shape, each 6 in. thick, and carrying a 6-in. gun. Forward and aft are barbettes, each mounting a single 9.4-in. gun, and protected by stout shields. These barbettes will have a total height of about 9 ft., will be 6 in. thick, with armored hoists descending to the protective deck. The conning tower, which will have a thickness of 6 in. or more, will have an armored tube of communication.

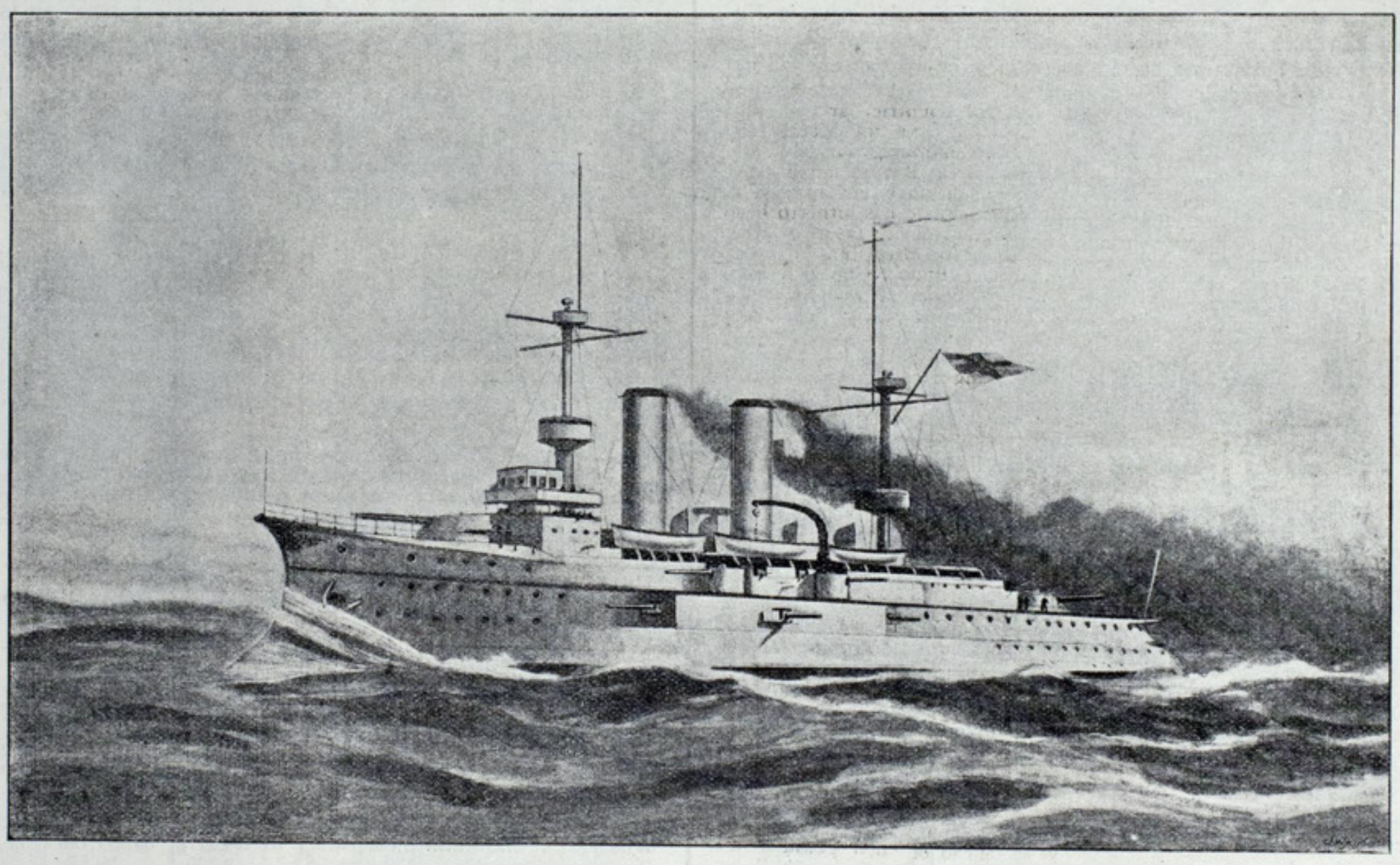
It will be noted that the Prinz Heinrich has little in common with the Fürst Bismark. The later has no protection to the lower deck, and has her armament a good deal more distributed. The Prinz Heinrich, on the other hand, is a direct adaptation of the French Brennus, and closely resembles that ship both in the disposition of armament and in the system of armoring. The high forecastle and the bow submerged tube are the only distinctly German features in the design, and there is nothing of the Fürst Bismark about her save in general outline.

Like all German ships, the Prinz Heinrich will have no wood used in her construction, unless the latest discovery, or supposed discovery, that woodless ships are very unsanitary, causes some departure from a well-established German custom. The estimated indicated horse power is 15,000, which is expected to give a speed of 20 knots. There are three screws, and the deadwood aft is very much cut away after the Elswick model, in order to make the ship relatively handy. This, for a cruiser, she should be, as she has a very fair proportion of beam to length. The boilers selected for her are of the Dürr type.

It may be of some interest to compare the Prinz Heinrich of 1900 with the Edgar class of 1890 and the Orlando of 1886, since the armaments in each case are practically identical, though the German 9.4-in. gun is, of course, a far more powerful gun than the old 9.2-in. in the other ships. This, however, is more an accident of date than anything else, and in so far as the modern guns are all heavier, enforces rather than detracts from the point we wish to make—the difference between what was demanded then and now for a ship carrying a more or less standard armament for a first-class cruiser in the way of protection and speed.

	Orlando.	Edgar.	B'ake.	P. Heinrich.
Date ot launch	1886	1890	1891	1900
Displacement, tons	5700	7700	9000	8868
Length, feet	300	360	375	394
Beam, feet	56	60	65	65½
Draught, feet	26	26	27½	24¾ (mean)
Armour belt, inches	10	Nil	Nil	4
Do., lower deck, inches	Nil	Nil	Nil	4
Do., battery, Q.F., inches	Nil	6 in. on 4 guns.	6 in. on 4 guns.	6
Do., big guns, inches	4½in. shields	4½in shields	4½in. shields	6
Do., deck, inches	3	5	5	2¾
I. H. P. *circa*	9000	10,000 to 12,000	20,000	15,000
Speed, trial	18.5 to 19	19.5 to 20	21.5	20 (est.)
Actual sea-speeds at a push	15.5 or less	19.5	20.5	—

The Orlando, the only cruiser carrying belt armor except the Prinz Heinrich, has less than this ship, and is altogether smaller. She belongs to the era of "paper" ships, and to this day, with her 10-in. "armor belt"—all under the water-line, by the way—and heavy armament, is a grand ship for the makers of statistics. The Prinz Heinrich could probably tackle three of her. The Edgar and Blake are more interesting comparisons.



GERMAN ARMORED CRUISER PRINZ HEINRICH.

All the class are as good ships as ever were built for speed. Although now nearly ten years old, they are all excellent steamers, and in the recent maneuvers kept station at 19 knots without the least difficulty. Ten years have seen far less advance in speed than people are prone to imagine. It is exceedingly doubtful whether there is a warship in the world that would beat the Edgar class in a thirty hours' race. Probably the Russian cruiser Variag, recently built at Cramp's, Philadelphia, might. The advance of recent years has been in protection, and the problem today is to pile on armor without deteriorating the other cruiser essentials.

BIDS SOLICITED FOR THE ARMORED CRUISERS.

Secretary Long has issued advertisements for the construction of the protected armored cruisers, and has announced that bids will be opened on Dec. 7. Six armored cruisers are to be constructed, three of which will be sheathed and coppered. The general characteristics of all the vessels are the same, except as regards sheathing and coppering, and the variation in dimensions and displacement consequent thereon. The unsheathed vessels, if the department's design is followed, will be about 502 ft. long, about 69 ft. 6 in. in breadth, about 13,400 tons displacement and will draw, when fully laden, about 26 ft. 6 in. They will have a coal bunker capacity of 2,000 tons and a speed of not less than 22 knots. In their main batteries will be four 8-in. guns in pairs, in two electrically controlled, elliptical, balanced turrets, one forward and one aft; four 6-in. guns will be mounted in sponsons at each corner of the superstructure, and on the main floor of the gun deck ten 6-in. guns in broadside will be mounted. The secondary batteries will contain eighteen 3-in. breech loading rifles, fourteen 14-pounders, twelve 3-pounder guns, four 1-pounder automatic guns, four 1-pounder single shot guns, two 3-in. field guns, two machine guns; six automatic guns of small caliber and two submerged torpedo tubes. Each vessel will be protected by 1976 tons of armor and 100 tons of cellulose. Each vessel is to be fitted as a flagship.

WORLD'S IRON ORE SUPPLIES.

MANUFACTURING COUNTRIES OF EUROPE ARE ALL HEAVY IMPORTERS—ALL REPORTS FROM ENGLAND INDICATE WORRY OVER FUTURE SUPPLIES.

The British Iron Trade Association has given to the public its compilation of statistics upon the available iron ore supplies of the world and the figures are quite interesting. Of chief interest in the report are the statements showing the relative positions of the leading iron producing nations. While written for English readers it is nevertheless interesting for Americans. The report follows:

About ten years ago the total consumption of iron ores throughout the world was computed at about 50,000,000 tons, of which about 15,000,000, or 30 per cent. was raised in the United Kingdom, and only a trifle over 12,000,000 tons, or say 25 per cent. in the United States. Since then iron ore supplies have undergone a great transformation. The United States in 1899 produced about 25,000,000 tons of iron ore, against little more than half that quantity produced in the United Kingdom, and the total world output of iron ores has reached about 90,000,000 tons, which is an increase of 80 per cent. on the output of 1888. In 1880, Great Britain produced over 18,000,000 tons of home ores and depended only to a relatively limited extent on imports. Indeed, previous to 1880, the British imports of iron ore never materially exceeded 1,000,000 tons. But from that date our imports rapidly increased until in 1899 they rose to upward of 7,000,000 tons, and represented an output of fully 3,500,000 tons of pig iron. Great Britain is not alone in her dependence on foreign iron ore supplies. Germany in 1899 imported 4,165,000 tons of iron ore, equal to 20 per cent. of her total consumption; France, 1,950,000 tons, equal to nearly 30 per cent. of her entire consumption; and Belgium, 2,621,000 tons, equal to 90 per cent. of her total consumption. Most of the imports of these three continental countries are received from conterminous territories, Germany importing from the Meurthe-et-Moselle, France from Alsace-Lorraine or Luxembourg, and Belgium mainly from the adjoining Grand Duchy. But Great Britain imports her supplies almost entirely from places at a remote distance, and mainly, as we all know, from the Spanish peninsula. So complete has hitherto been our dependence on Spain, that in any consideration of our future sources of supply that country must necessarily come in for attention.

Thirty years ago we were about beginning to import iron ores from that country. Our total imports in 1869 were under 100,000 tons. In 1889 Great Britain imported from Spain 6,224,000 tons of iron ore, which was about 70 per cent. of the total quantity of ore raised in that country. The province of Biscay furnished last year nearly 6,225,000 tons of ore, or about 66 per cent. of the total supply of the kingdom. In the meantime the iron ores of about twelve other provinces of Spain have been developed, and some of them have reached an output of considerable importance, three of them, not counting Biscay, having last year furnished more than 500,000 tons each. In 1899 shipments of iron ore were made from more than twenty ports in Spain to eight different countries, which included Austria and the United States. Of late years one of the questions that has been a great deal discussed is that of the duration of the iron ore supplies of Spain. Mr. de Lazurtigui computes the total quantity of non-phosphoric ores at the beginning of last year to be 150,670,000 tons, and of phosphoric ores at 75,000,000 tons.

Several countries appear to invite more consideration than they have probably yet received. At the present time over 1,000,000 tons of iron ore are raised annually in Greece, mostly for consumption in France. Another important source of supply is Turkey, where iron ores are abundant, but as yet worked on a very limited scale. Yet another well-known source of supply is Morocco. Some important new deposits have lately been opened up in Algeria. It is hardly necessary to speak at any length of the iron ores of Gellivaria, and of Swedish Lapland, in Sweden. The railway now being built from these Arctic ores to the Atlantic will, in the course of a year or two more, enable ores to be shipped all the year round, but it is stated the quantity available for export is limited to less than 3,000,000 tons a year, and that the greater part of this supply has already been contracted for some years ahead of their possible delivery, by German and Belgian iron making firms. The great bulk of this ore is phosphoric, so that, in any case, Sweden is not likely to do much in the way of increasing the supply of purer ores suited to the acid steel process, and in reference to our own outlook from this point of view, is little better than a negligible quantity. Norway has considerable ascertained deposits of iron ore which may ultimately be brought into use for British requirements. These deposits are described as ranging from 50 to 62 per cent. of iron, both phosphoric and nonphosphoric, as probably equaling 840,000,000 tons in quantity, of which 200,000,000 tons are of good quality, exceeding 55 per cent. of iron, and as ranged along the course of the Dunderland river, whence access is obtained to a good natural harbor, which can accommodate ships up to 3,000 tons. Some of the British colonies may be expected to make important contributions to the quantity of ores at the command of British iron masters. Among these Newfoundland and Cape Breton occupy a prominent place. So far as Europe is concerned the only competitive countries at present have no advantages over our own. Indeed, most of them are less favorably situated than Great Britain, and all of them, like our own country, are compelled to import larger or smaller supplies from year to year in order to supplement their own. But in the United States it is otherwise. It is a matter of common knowledge that in the southern states the ore required to produce a ton of pig iron costs only 8s. to 10s. at the furnace, and pig has been produced in large quantities at 24s. per ton. The Pittsburg iron is produced at a distance of about 450 miles, and the southern iron of Alabama and Tennessee at a distance of 250 to 300 miles from the tide water.

If it be true that the quantity of hematite or bessemer ores available for the purposes of the British iron industry is limited, whether at home or abroad, it is probable that increased attention will require to be given to the production of basic steel, and that the acid process must largely be discontinued. Great Britain, which produces 20 per cent. of the total steel output of the world, does not produce more than 8½ per cent. of the make of basic steel, while less than 17 per cent. of the total British make of steel takes the basic form. If Great Britain is to maintain her position as a steel producing country she will require to prepare for taking up the basic steel manufacture on a larger scale, absolutely and relatively, and any impediments now standing in the way of that line of progress will have to be overcome. Some 90 per cent. of the total make of German steel takes this form, and the United States are going rapidly forward in the same direction, while nearly one-half of the total steel output of France is basic. It is clear that for the basic steel industry the ores available promise a much longer life than is guaranteed to the rival process, while we could not depend on manufacturing more than one-fifth of our present steel output from British bessemer ores. The limited supplies of bessemer or hematite ores have compelled the works on the west coast to resort to considerable imports of Spanish ore. It is obvious that if this movement is carried much further—in other words, if the Cumberland supplies diminish—the works on the west coast, which are not so favorably situated for fuel supplies as those in other leading iron making centers, may witness some important changes. But whatever may be in store for the west coast as such, it is hard to believe that works like those of the east coast and South Wales that are mainly on the seaboard, and within thirty miles of the coal field, can long remain at a serious disadvantage in the competition for the markets of the world.

SHIPPING TRADE OF DENMARK.

Details relating to the shipping trade of the kingdom of Denmark for the year 1899 have just been made public by the Danish statistical bureau. The information is given under three heads, namely (1) the maritime traffic between Danish ports and foreign ports; (2) also between the ports of Denmark, including the coasting trade proper; (3) the cargo-carrying trade per Danish vessels between foreign ports. In the trade between foreign and Danish ports last year the total amount of merchandise moved amounted to 3,665,000 tons, being 95,000 tons more than in 1898 and 239,000 tons more than in 1897. As regards the trade per sailing vessels, however, the statistics show a falling off last year of 33,000 tons compared with 1898, while the quantity of cargo moved per steamers was greater by 125,000 tons. By far the greater part of the general increase stands to the credit of the import trade; this amounting, in fact, to about four-fifths of the whole maritime traffic, while the export trade only absorbs about one-fifth of the whole. The number of sailing ships and steamers participating in the Danish shipping trade last year was about equal, but the steamers represented 86.5 per cent. of the whole carrying capacity, and 75.7 per cent. of the merchandise moved was conveyed per steamers. The average capacity of the steamers was 320 tons, and that of the sailers was only 51 tons, but a far greater proportion of the tonnage capacity of the sailers was used than was the case with the steamers. Two-fifths of the whole maritime trade of Denmark is carried on with Great Britain; then follow Sweden and Germany with about a sixth, and the United States of America with an eighth. About one-half of the inward traffic was effected last year by foreign vessels, but only about a third of the outward trade. Of the vessels under foreign flags it was more especially Swedish sailers and British steamers that were engaged in the oversea transport of cargo; of the whole traffic per sailing vessels one-third stands to the credit of the Swedish flag, and of the steamship traffic between a fifth and a sixth of the whole falls to the British flag. The figures show, however, that the quantity of cargo conveyed to or from Danish ports last year by British vessels was 82,000 tons less than in 1898, and it was Danish steamers principally which secured what the British steamers lost. There was also a slight falling off in the traffic per Swedish sailers last year, but this may perhaps be accounted for by the general reduction in sailing ship navigation which is going on everywhere.

In the Danish coasting trade the total movement of cargo last year was 694,000 tons, against 675,000 tons in 1898 and 659,000 tons in 1897. In this increase both sailers and steamers participated. The coasting trade was carried on almost exclusively by vessels under the Danish flag, only 3 per cent. of the whole falling to foreign vessels, principally German and Swedish. The port which plays the greatest part in Denmark's shipping trade is Copenhagen—2,300,000 tons of cargo having been landed or shipped at that port last year. After Copenhagen follow Aarhuus with 360,000 tons of cargo, Aalborg with 260,000 tons, Esbjerg with 210,000 tons, Odense with 120,000 tons, etc. The greater portion of the trade at all these ports is done with Great Britain; as regards Copenhagen, however, if the free harbor is taken separately, the principal part of the trade of this portion of the port is done with North America, about half of the imported goods landed there coming from that part of the world.

Finally, the statistics show that more than 25 per cent. of the whole carrying trade effected by Danish vessels between foreign ports is done with Great Britain and Ireland, 18 per cent. with Germany, and 15 per cent. with Russia, etc. Nearly three-fifths, therefore, of the work done by Danish cargo carriers between foreign ports is divided between the three countries named.

BATTLESHIP WISCONSIN'S TRIP.

A record-breaking trip was made by the new battleship Wisconsin from Seattle to San Francisco. She ran from Seattle to Point Bonita light, 806 miles, in 59 hours. The steamer Queen, which has the reputation of being the fastest boat on the Pacific coast, arrived from Seattle the night before, having made the voyage in 65 hours. The Wisconsin's average speed for the run was 14 knots. Irving M. Scott, her builder, said: "She handles like a yacht. She minds her rudder so as to turn in a length and a half at any speed. On the return voyage she averaged almost the speed of the Oregon on her famous voyage from San Francisco to Santiago. Every part of the ship worked to perfection."

Messrs. Flint, Dearborn & Co. will dispatch the first steamer of their new line to San Francisco in the near future. Their first steamer will be the Hyades, completed at Sparrow's Point, Md., June last. She is owned by the Boston Tow Boat Co., but has been chartered by the American-Hawaiian Steamship Co., to replace their new steamer Californian, which was taken by the United States government for the army transport service. The Hyades is a large carrier, but as a full cargo is waiting for her she will receive prompt dispatch. With the opening up of the steam route between New York and San Francisco the few American clipper ships left will have to seek other trades.

IRON AND STEEL TRADE.

THE VAST DEVELOPMENT OF THE UNITED STATES IS CLEARLY OUTLINED—PROBLEM IS NOW COMMERCIAL, NOT INDUSTRIAL—NEED SHIPS AND SCHOOLS

The treasury bureau of statistics has just issued a commercial monograph on the iron and steel trade of the United States, treating of the resources of this industry, its development and its relations to the domestic and foreign markets. In this document the progress of the iron and steel trade is illustrated by maps and diagrams showing the distribution of iron ores in Europe and North America, the comparative development in the production of pig iron by countries since 1873, the growth of the steel output of the several leading nations, the change in the relation of iron and steel exports and imports, and the course of prices for pig iron and steel rails in the United States. The United States is now the world's greatest producer of iron and steel and coal, as well as of copper, cotton, breadstuffs, provisions, and many other articles entering into the daily requirements of man.

In a comparative survey of the world's iron ore situation, the remarkable fact is brought out that the United States in 1899 produced 30 per cent. of the world's ore, or 25,000,000 tons out of a total of 85,000,000 tons, in round numbers. This quantity is somewhat less than the combined ore output of both Great Britain and Germany, including Luxemburg, which produced respectively 17 per cent. and 21 per cent. of the world's ore supply. This alone gives the United States the leadership among the world's great ore producers; but this fact must be taken in connection with coal production on which the iron industry depends, and of which this country produces 32 per cent. of the world's output, while Great Britain produces 30 per cent. and Germany 19 per cent. With primacy in coal and iron ore the position of the United States is one of undisputed and permanent ascendancy in her control of the raw materials of iron and steel production. This primacy in raw materials gives the United States a self-sufficing position, as compared with that of her foremost rivals—Germany and Great Britain. While the Dortmund, Germany, furnaces have to go to northern Sweden for iron ores and the furnaces of Cleveland (England) have to get their ores from northern and southern Spain, the United States is far freer to locate her iron and steel industries with direct regard to the conditions of maximum economy in the accumulation of raw materials and the distribution of the finished products. Therefore, as coke has displaced coal, the tendency the world over is for the furnace to leave the colliery and move toward the ore mines. Hence the iron and steel industries of this country are gradually being drawn around the southern shores of Lake Erie within easy access of the vast ore deposits of the Lake Superior mines. The preponderance of this single source of ore production is apparent from the fact that the Lake Superior region furnished 73 per cent. of the 25,000,000 tons of ore consumed by our furnaces in 1899, while the southern states furnished 19 per cent. and the eastern states but 8 per cent. One of the most wonderful developments in modern trade is that of the ore handling facilities from the Lake Superior mines to the furnaces of Ohio and Pennsylvania.

Among the world's great pig iron producers the United States first attained the leadership in 1890; but in 1894 lost it to Great Britain again, only, however, for the time being. In 1895 the United States finally outranked the United Kingdom. In 1899, the five great pig iron producers stood in the following order of importance:

Countries.	Tons.
United States	13,620,703
Great Britain	9,305,319
Germany	8,142,017
Russia	2,672,492
France	2,567,388

There are other nations to be mentioned, such as Austria-Hungary and Belgium, each of which produces 1,000,000 tons, and Sweden, whose output is 500,000 tons. But the mere fact of primacy in pig iron production, on which the steel industry depends directly, has the utmost significance for this country at home and abroad. We are also the greatest consumers of our iron and steel products. The development of a domestic consumptive capacity has been a feature of the national policy toward the iron and steel trade. It has been followed by the growth of a national demand unequalled by any other nation. The volume of demand thus developed has resulted in that gradual reduction in the cost of production which has brought this country fully equipped to enter the world's markets on a level with the best of her rivals. Her position in the world's markets is therefore not ephemeral,, but enduring, because it is based on a highly developed and rapidly enlarging home market such as no other nation now enjoys.

The growth of the steel industry is next taken up, and the transition from the iron to the steel age is indicated by the substitution of steel rails for iron rails in railway building. Here again the United States holds the primacy, because of her producing almost 40 per cent. of the world's steel output, while Great Britain produces 18½ per cent. and Germany 21 per cent. No other nation converts so much of its pig iron into steel as the United States does. Of the world's pig iron output 40,000,000 tons, 70 per cent., is made into steel; whereas, this country converts 77 per cent. of its pig iron tonnage into steel, amounting to 10,636,858 tons out of the world's total output of 27,110,000 tons. The United States is the foremost steel-consuming country of the world, a single city having consumed 125,000 tons in a year for building purposes alone, and one car company having required 400,000 tons of steel to meet its yearly contracts. In 1879 about one-third of our pig iron was made into rails, but since that date steel rails have ceased to be the chief form of steel production, their proportion in 1898 being but one-sixth of the whole. The consumption of steel per capita for non-rail uses in 1879 was 75.4 pounds; in 1889, 213.2 pounds; in 1898, 276.2 pounds, showing how other than rail uses of steel have developed in twenty years.

In our iron and steel trade with foreign countries, covering the last twenty years, our position has been exactly reversed. Within the last few years we have actually changed from an importing to an exporting nation. In 1880 we imported five times as much in value as we exported iron and steel products. Now we export six times the value of our iron and steel imports. These exports in 1900 aggregated $121,858,341, thus ranking next to breadstuffs, cotton and provisions, the three higher in value. There are in the iron and steel exports twenty-one classes valued at from $1,000,000 to $9,000,000 each.

These facts and relations give the iron and steel trade an economic outlook such as has never before been attained. While Great Britain and Germany are still leading us as exporters of iron and steel of certain classes, our experience at home in adopting machinery and implements and other forms of steel products to the varied conditions of our vast territory has prepared us to adapt our products to the conditions of climate and the wants of consumers the world over. We have prospered hitherto by reason of the high efficiency of labor, by the superiority of our industrial organization and by continuous progress in technical invention. But other nations are learning our secrets of success. Other nations are imitating our methods and making models of our machinery and tools, in order to overcome the advantages we now have over them. Prussia and Bavaria, France and England, all import our railway engines only to pick out their excellencies and then incorporate these into their next new types to be made at home. The policy of the future must take this fact into account, and the only way to meet it is by a restless progress in productive processes at home, a systematic study of the conditions and requirements of American iron and steel products abroad, and a more considerate cultivation of the consumer than has hitherto been the case. With proper exceptions consumers have heretofore bought our products on their merits without solicitation from us; but as our competitors learn to incorporate those merits into their own makes, our position can be secured and improved upon in the future only by aggressive methods, in which the commercial and the consuming interests of the foreign trade are made to realize our readiness to meet their conditions with a superior product. Hence the main problem of the American iron and steel trade is now not industrial, nor financial, but commercial. Our pig iron trade with Europe, for example, is limited by the quantity of bottoms offered it as ballast in cotton cargoes. Everywhere, too, our foreign trade suffers for want of trained commercial representatives. Our greatest commercial needs, as has been well said, are ships and schools.

AMERICAN STEEL & WIRE CO. AT THE PARIS EXPOSITION.

The American Steel & Wire Co.'s exhibit at the Paris Exposition is one of the most complete and interesting of the entire show. The installation is in the department of mines and metallurgy. It was not placed with the other exhibits from the United States on account of a lack of space. On the main floor the exhibit occupies a space 50 x 50 ft. It comprises iron ore and coal from the company's mines in Michigan, Minnesota, Wisconsin and Pennsylvania, limestone from their quarries, coke from their ovens, pig iron from their blast furnaces, the quality and nature of the pig iron being illustrated by fractures and ingots, blooms and billets from Bessemer and Open Hearth steel mills.

All the above are compactly grouped near the entrance to the exhibit. In the center is an ornamental bronze pagoda with art glass roof. In the pagoda are panels illustrating various manufactured products, such as sections of beams, channels, angles and bars; sections of shafting, rail splices and frog filling; horse shoes, spikes, nails and tacks; barbed wires, bale ties, fine copper wires, music wires, fine spooled wires; all sorts of chains and rivets; coiled, spiral and flat springs, clock springs; wire ropes, insulated wires and cables, sections of marine cables, etc. In the space surrounding the pagoda are samples of sheet steel with illustrations of quality in the shape of cold bending and stamping tests, large steel boiler heads, many bundles of woven wire fences and galvanized poultry netting. Piled in attractive pyramids are wire rods, steel and copper wire in bundles and on reels, copper trolley wires, weather proof and lead encased cables, copper rail bonds, wire ropes, and so on. The astonishing feature of the exhibition is the great variety of products shown. The entire range of the steel producing industry appears to be covered by the products of this company, which is popularly, but erroneously, supposed to be confined to the wire industry.

The gallery or auxiliary exhibit consists of forty large panels, 6 x 5 ft., on which are artistically grouped products of the various departments, while in glass cases beneath the panels additional samples and test pieces are shown, the entire square being surmounted with fifty large photographic reproductions or birds-eye views of the various mines, furnaces, steamships and manufacturing establishments owned and operated by the company.

The entire exhibit is certainly a credit to the American Steel & Wire Co. It was designed and arranged under the personal supervision of Mr. P. W. Moen, third vice-president, and Mr. F. H. Daniels, chief engineer. It was entirely set up, before shipment to Paris, in the Worcester plant, then taken down, shipped and reconstructed on the other side. This wonderful demonstration was of course awarded with high honors. The awards are as follows:

Four grand prizes, (the highest possible award), two gold medals and a collaboratory gold medal each to President Palmer and Chief Engineer Daniels, expressive of appreciation of their share in making such a showing for their company.

One grand prize, class 26.—The highest possible award, for iron and steel galvanized telegraph and telephone wires, pure copper wires, insulated conductors, rail bonds, trolley wires, feeder cables for light and power, aerial, underground and submarine cables.

One grand prize, class 7.—Music wire, for greatest tensile strength, ductility and high finish.

One grand prize, class 63.—Governing metallic ores, coal and coke, also natural mineral paints such as venetian red and copperas, of which this company is the largest manufacturer in the world.

One grand prize, class 64.—Covering pig iron, steel in ingots, bars, sheets, finished plates and wire rods; also copper and copper alloys, ingots, bars, etc.

One gold medal, class 30.—Covering bicycle and carriage wire spokes and kindred products.

One gold medal, class 65.—A general metallurgical class, including wire nails and tacks, barbed wire, wire rope, horse shoes, woven wire fencing, springs, chains, staples, wire netting, and kindred products of the wire industry.

A grand prize was voted on class 65, but withdrawn because a grand prize had already been awarded in classes 63 and 64, which being so closely related to class 65, it was considered a crowding of honors to award another prize in this class.

MORE ORDERS FOR SHIPS ON THE GREAT LAKES.

All vessels thus far built or under order on the lakes for salt water service have, of course, been designed with a view to meeting requirements of either the British Lloyds or the Bureau Veritas, at least as regards the coasting trade. Most of the vessels have been built under Bureau Veritas survey, so that there would be no question as to favorable insurance, and Lloyds' rules have always been taken into account in their design. But the first to be constructed strictly on a Lloyds basis and for class in the British register is the vessel for which the Detroit Ship Building Co. have closed a contract a few days ago with C. T. Morley of Marine City, and others. This steamer is to be of Canadian canal size, carrying about 3,000 gross tons on 20 ft. (she can load to that draught when on salt water), and will cost about $165,000. She is not to be finished until September next. Dimensions are: Length over all, 260 ft.; beam, 40 ft.; depth, 26 ft. 6 in. Engines are to be triple expansion, the cylinders measuring 17, 27½ and 46 in. diameter, with common stroke of 26 in. There will be one main boiler of Scotch type, 13½ ft. diameter and 12 ft. long, fitted with Howden hot draft, and an auxiliary boiler of 7½ ft. diameter and 9 ft. length.

Another order placed on the lakes during the past week is for a steel freight and passenger steamer, to cost probably $350,000, and to be operated by Capt. Beatty of Sarnia, Ont., in connection with the steamers Monarch and United Empire. This vessel will be built at the new ship yard in Collingwood, Ont., with which Capt. Alex. McDougall is connected. It is said that this steamer will have accommodations for 400 passengers and will be designed for a speed of better than 18 miles an hour.

A dry dock capable of accommodating the largest vessels of the lakes will undoubtedly be provided at Buffalo shortly by the American Ship Building Co., which controls the docks operated by the Buffalo Dry Dock Co. Work on a large dock may in fact begin at once. The transfer of Supt. W. W. Waterson from the Lorain works to Buffalo is probably prompted by the improvements that are contemplated at the latter place. Mr. Waterson, who was for a long time connected with the Ship Owners' Dry Dock Co. of Cleveland, has had all manner of experience with dry docks and has been very successful in handling large forces of men. It is understood that he will be succeeded at Lorain by Supt. Jeffrey of the West Bay City works.

The steel steamer Waccamaw, designed for lumber trade on the Atlantic coast, and constructed by the Craig Ship Building Co. of Toledo on order from J. L. Crosthwaite of Buffalo, is now passing down the St. Lawrence. Tolls on vessels passing through the Canadian canals to the seaboard are very reasonable. It costs about $71 in pilotage and canal fees to take through a vessel of 2,000 measured tons. The rate is 2½ cents a measured ton, and a pilotage fee of $1.50 a foot draught.

Officers of the Chicago Ship Building Co. now are: President, Wm. L. Brown; vice-president, B. W. Wells; secretary and treasurer, O. R. Sinclair; general manager, J. A. Ubsdell, Jr.

AROUND THE GREAT LAKES.

Five vessels have been lost with cargoes of iron ore thus far this season—Holloran, Fontana, Martin, Lyon, Dundee—and it is strange that all five of them were owned in Cleveland.

About Oct. 13 a fixed red post-lantern light will be established at the southerly end of Racine breakwater, Lake Michigan, and on or about the same date the intensity of the light on the northerly side of the inner entrance of Muskegon lake will be increased by changing it from a lantern to a lens-lantern light.

Even with Duluth grain shipments far below the average, the receipts at Buffalo up to this time are about 4,000,000 ahead of what they were a year ago. Chicago grain men are certainly exerting some strong means in securing and disposing of far more than their share of the grain this year. Buffalo has been handling grain of late at the rate of about a million bushels daily.

A party of investors organized by R. J. Dunham of Chicago, son of Capt. J. S. Dunham, tried to make arrangements, a short time ago, for the construction of a steamer of Canadian canal dimensions, but could not secure delivery until late next season. Now they have practically concluded arrangements for the purchase of the Wilson line steamer Ravenscraig, which is of canal dimensions and which was built last winter by the Jenks Ship Building Co. of Port Huron.

The Jenks Ship Building Co. of Port Huron has undoubtedly turned out a very good boat in the steamer Capt. Thos. Wilson, their first big freighter. On her first trip she loaded 6,282 gross tons of ore at Ashland for South Chicago. Her draught was a little less than 18 ft. A report from the steamer on her up trip light said that she made the run across Lake Huron, from Fort Gratiot light to Detour, a distance of 225 miles, in 17 hours, being nearly 13½ miles per hour, and when on Lake Superior for three and a half hours logged 14½ miles per hour, with engines turning 94 and 95 revolutions per minute.

Although it has been said repeatedly that the W. J. Conners scheme for new grain elevators and warehouses at Montreal was dead, Mr. Conners still seems to be at work on the project and talks of also having vessels built in England for grain and package freight trade between upper lake ports and Montreal. The newspaper dispatches from Montreal would convey the impression that the whole project was fixed up. One of them says: "It is expected that from now on the work on the Conners elevator, warehouses, etc., will progress without interruption. The work is begun on the site of what will eventually be the working elevator, and which is to have a capacity of 1,000,000 bushels. The cost of the elevator proper is estimated at $650,000. This, of course, does not take in the grain storehouses, which will be connected with the working elevator by means of grain conveyors, or the other extensive freight warehouses, which it is proposed to eventually erect. The elevator will be 271 ft. long and 89 ft. deep. It will have a storage capacity for 1,000,000 bushels of grain and a working capacity of 3,000,000 bushels. Arrangements are practically closed for the construction of the necessary barges and steam vessels for the carrying of grain through the inland waters. Swan & Hunter, ship builders of Wallsend-on-Tyne, will very probably get the contract for building the vessels. The tow barges are to be of 100,000 bushels capacity and the steamers of 80,000 bushels capacity."

QUESTION OF STEEL EXPORTS.

The story from Pittsburg about the Carnegie company shipping steel to Europe by way of the Carnegie railroad to Conneaut on Lake Erie and then by vessel through the Canadian canals of the St. Lawrence sounds well on paper, but the scheme is not commercially practical. Possibly it may help as an argument to bring about a reduction in freight charges on the railroads operating between Pittsburg and the seaboard. These charges are quite a hindrance just now to exports of steel from Pittsburg and the railroads are not disposed to reduce them. No doubt the vessels of the Lake Superior Power Co., which will return to England from the lakes this fall, will take across the Atlantic the consignment of steel referred to in the Pittsburg dispatch, but the conditions that permit of the shipment from Pittsburg by way of the lakes are of a special kind. The Sault power company's vessels would return to England in any event, as it was the intention when they were brought to the lakes, under pressure of the high freights that prevailed last spring, to have them return to salt water for winter service. Of course they will take cargo of some kind from the lakes, no matter how small their loads may be on account of the limited draught in the St. Lawrence canals. The canals are all right for the movement of freight to Montreal, and will eventually get considerable business in competition with the transfer at Buffalo of export freight for the seaboard. The canals will also serve for the passage of vessels from the seaboard to engage in lake trade; or for the passage of vessels from the lakes to the seaboard to engage in seaboard trade; but they are not suited to through traffic from the lakes to Europe, and will not be until they are capable of passing vessels carrying cargoes much larger than can be carried at present. The foreign consignment of Carnegie steel which is the subject of Pittsburg reports, would not be shipped by way of the lakes but for the fact that the Sault power company's vessels happen to be returning across the Atlantic and can take this jag of steel as part cargo. There are no other vessels to engage in such a trade, and even if the vessels were to be had they could make no money at taking part cargo on the lakes and then loading something else at Montreal; certainly no money in competition with the rail charge from Pittsburg to the seaboard, especially as the steel or other commodity would have to bear the expense of rail charge from Pittsburg to Conneaut and additional handling charges at the latter place. The talk of vessels towing barges or lighters from the lakes through the St. Lawrence canals and then making up full cargoes from these lighters at Montreal is nonsense.

CARGO OF 269,000 BUSHELS OF CORN.

The steamer Simon J. Murphy, built by the Detroit Ship Building Co. and owned by Eddy Bros. of Bay City, now enjoys the distinction of having loaded the heaviest cargo of grain ever placed aboard a vessel of the great lakes. She left South Chicago Tuesday, with 269,000 bushels of corn, equal to 7,532 net tons. Iron ore cargoes aggregating as much as 8,339 tons have been carried, but the Murphy's cargo is the heaviest grain load. It is not, of course, equal in bushels to some of the very large cargoes of oats that have been moved during the present season, but in weight it exceeds any grain cargo thus far reported. Cargo records, corrected to date, are as follows:

Iron Ore—Steamer William Edenborn, A. B. Wolvin of Duluth, managing owner, 7,446 gross or 8,339 net tons, Two Harbors to Conneaut; tow barge John Smeaton, owned by Bessemer Steamship Co. of Cleveland, 7,446 gross or 8,339 net tons, Duluth to Cleveland, draught 18 ft. 1 in.; tow barge Manila, Minnesota Steamship Co. of Cleveland, 7,399 gross or 8,237 net tons, Two Harbors to South Chicago, draught of 18 ft.

Grain—Steamer Simon J. Murphy, owned by Eddy Bros. of Bay City, 269,000 bushels of corn, equal to 7,532 net tons, South Chicago to Buffalo; steamer Superior City, A. B. Wolvin of Duluth, manager, 266,550 bushels of corn, equal to 7,463 net tons, South Chicago to Owen Sound, draught of 18 ft. 2 in.; steamer Douglas Houghton, Bessemer Steamship Co., 308,300 bushels of clipped oats and 60,000 bushels of corn, equal to 7,528 net tons, Manitowoc to Buffalo.

Coal—Steamer O. M. Poe, owned by Bessemer Steamship Co. of Cleveland, 6,585 net tons of bituminous, Erie to Duluth; steamer Hendrick S. Holden, Capt. John Mitchell and others, Cleveland, 6,432 net tons of anthracite, Buffalo to Duluth, on a draught of 17 ft. 4½ in.

STEAM TOWING MACHINE ON THE GULF OF BOTHNIA.

Steam towing machines of the Shaw & Spiegle type, manufactured by the American Ship Windlass Co. of Providence, R. I., will soon be used in all parts of the world. The Providence company has just received from its Liverpool agent a copy of a letter from Denmark telling of the success of a machine shipped some two or three years ago to the Ohrvikens Aktiebolag. The Ohrvikens company says:

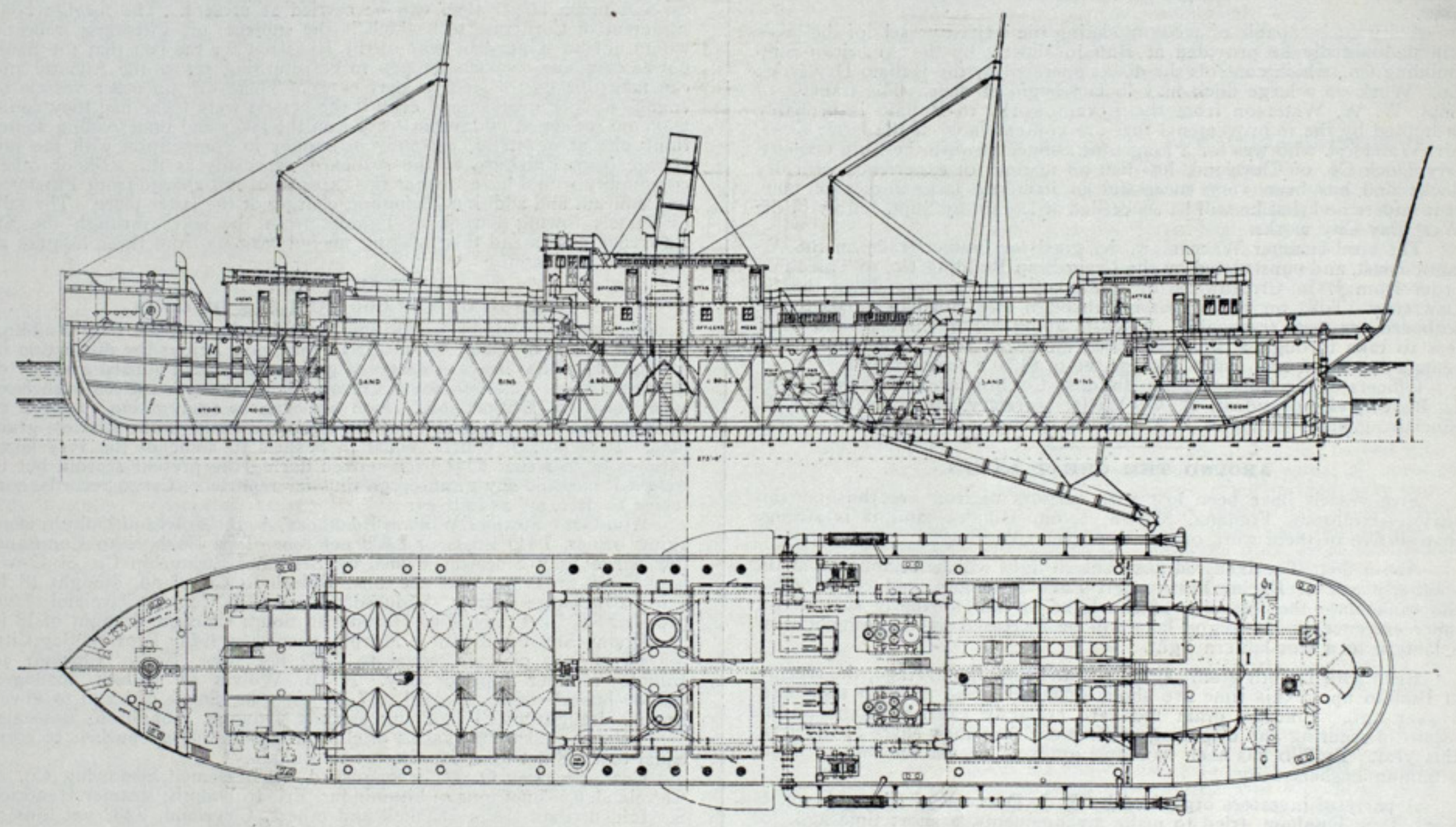
"The steam towing machine to which you refer is on our tug Industrie, which is generally used for towing timber logs from the upper ports of the Gulf of Bothnia to Skelleftea ports, in which service she has to pass part of her way in the open sea outside the islands. In these parts the sea is often very rough, and she has hard work to make her way with the heavy bulks of logs, and to take much care not to have the timber scattered about all round the sea. Sometimes she tows at the same time up to 13,000 logs. You know to lose that would cost a lot of money; and we dare say that, without the towing machine we would not dare to run that risk. Therefore, we suppose we can't say more than that we can't do without it. As to the hawser—which has been used now for nearly two years—we can see no fault in it; and suppose that, unless badly taken care of, it will last for years. Of course the machine is well protected with a roof, the hawser never getting wet but by the sea when used. We are very glad to be able to say that, from all points of view, we are very satisfied with the machine, and hope we will be the more so, the more we use it."

The steam yacht Waconta, now owned by James J. Hill, president of the Great Northern railroad, and better known as the yacht Eleanor, is now at the yards of the Eastern Ship Building Co., New London, Conn. She will be laid up for the winter and overhauled and a few changes made in the spring. The gentlemen that designed and built the vessel at Bath, Me., are now the officers of the Eastern Ship Building Co. The Waconta left Duluth late in September and arrived at New London, Oct. 2.

SELF-PROPELLING HYDRAULIC DREDGE.

PLANS AND DESCRIPTION OF A VERY LARGE MACHINE FOR MISSISSIPPI RIVER WORK—TO BE BUILT BY THE GOVERNMENT CAPACITY OF 2000 CUBIC YARDS OF SAND PER HOUR.

In the Review of the 20th ultimo there was presented a description of the steel-hulled, self-propelling, sea-going dredge Benyaurd, for the construction of which bids will be opened in Detroit on the 30th of the present month by Major Thomas H. Handbury, corps of engineers, U. S. A., who is a member of the Mississippi river commission. We are now enabled, through the kindness of Major Handbury, to present drawings of this dredge and the description is therefore repeated with some additional information. The Benyaurd was designed for use in connection with the new jetties that are to be built at the southwest pass of the mouth of the Mississippi river. The dredge is a part of the project for that work, and $350,000 is now available for its commencement. It is to be a very large dredge and will probably take rank in efficiency and cheapness of output with any that has yet been constructed. In the matter of living quarters and general accommodations for the crew, and also as regards such modern machinery as steam steering gear, windlass, electric light plant, refrigerating apparatus, etc., this dredge will be the equal of many large sea-going merchant vessels. The strength of hull is expected to be beyond that of vessels of like class and carrying capacity in the merchant service and all parts are to be built in accordance with this idea.



STEEL-HULLED, SELF-PROPELLING DREDGE BENYAURD—FOR UNITED STATES GOVERNMENT.

The hull is to be 275 ft. long between perpendiculars, 50 ft. molded beam, and is to hold 1,900 cubic yards of sand on a draught of 17 ft., and when light and ready for work to have a draught of not over 9 ft. The dredge will be propelled by twin screws. The speed going to the dump is expected to be not less than 10 knots per hour. The capacity of the dredging machinery will be equal to 2,000 cubic yards per hour of pumping time, when working under ordinary favorable conditions and taking the material from a depth of 30 ft. below water surface. Only general outlined drawings and such as may be deemed necessary to illustrate special features of the dredge will be furnished to the contractor. All detailed drawings necessary for the construction must be made by him as part of the contract. Delivery is to be made within ten months from the date of approval of contract and a penalty of $50 a day is required for all time after the date fixed for delivery. The hull, with sand bins, is to be built of steel throughout. There will be eight water tight compartments, formed by the collision bulkhead, each end and division of the forward bin, the water tight bulkhead between pump room and boiler room, the fore-and-after ends of after sand bins. Crew's quarters will be located forward of forward bin and aft of after sand bin. State rooms will be located under the floors of crew's quarters forward and aft. Raised fore deck and houses will be located on the main deck forward and aft and midships and will contain quarters for officers and crew, saloons, separate mess rooms for officers and crew, galley, cold storage room, linen lockers, china closets, bath rooms, water closets, etc.

The main dredging pumps—two of them—will be of the single-suction centrifugal type. They will be rights and lefts with respect to each other. Each pump will have a 20-in. suction and a 24-in. discharge opening, the discharge to be vertical. The shells are to be approximately 64 in. diameter and 30 in. deep, inside measurement. Each of these pumps is to be driven by a horizontal, direct-connected compound, condensing engine, capable of developing at least 350 I. H. P., at an approximate speed of 200 revolutions per minute, with boiler pressure of 135 lbs. per sq. in., and maintaining through the suction and discharge pipes the velocity necessary to carry at least 20 per cent. of sand with 80 per cent. of water against a maximum head of 32 ft.; this to be regarded as the average work of the engine, and to be done without overstraining the parts or heating the bearings. The two sets of suction pipes and appurtenances, to be of steel, will be located one on each side of the dredge. They will each be of 20 in. inside diameter, and from the center of the hole where they pierce the side of the dredge to the lower end of the drag, 80 ft. long, including 12 ft. of rubber hose to be placed about 8 ft. from the upper end. Hoisting engines of the double drum friction-clutch type, one on each side of the dredge, will be provided for handling the pipes and for doing other work.

There will be four single-ended return-tubular boilers (Scotch type), each of 11 ft. 3 in. length and 13 ft. 6 in. diameter, and each having three Morison suspension corrugated furnaces, 42 in. mean diameter. The working pressure is to be 150 pounds per square inch. Each boiler is to have not less than 63 sq. ft. of grate surface, and 2,217 sq. ft. of heating surface, and is expected to furnish steam to the extent of 600 I.H.P. without forcing, and shall have a total steam space of not less than 150 cubic feet. They are to be placed in pairs with the fire room between, and are to be so connected with each other and with the engines that they are to supply with steam that steam may be taken at once from all, or from any one of the boilers for any of the engines, as may be desired. An auxiliary boiler, to have a rating of at least 30 H.P., is also to be provided for the purpose of furnishing steam to such auxiliary engines, and heating system throughout the dredges, as may be required. Two ash ejectors (See pattern) and an approved ash hoist are features of equipment in this part of the vessel. Smoke stacks are to be of not less than 5 ft. 9 in. internal diameter.

The dredge is to be propelled by two screws of 8 ft. 6 in. diameter, with pitch suitable to 125 revolutions per minute, each screw to be driven by a vertical, inverted, surface-condensing, fore-and-aft compound engine, with independent condensers and air pumps. The engines are to be worked under a maximum boiler pressure of 150 lbs. per sq. in., and generally at a speed of 125 revolutions per minute with a boiler pressure of 135 lbs. Under these conditions they must be able to develop 800 I.H.P. They must also be capable of running easily at a sustained speed of 150 revolutions per minute, without undue strain or heating of parts, and when worked at lower rate of expansion, develop 1,000 I.H.P. Crank shafts, thrust shafts, propeller shafts, etc., are to be of open hearth steel. The condensers, two in number, are to be of Wheeler type. Feed pumps, high pressure pump for operating maneuvering machinery bin plugs, fire and washout pumps, etc., are all to be of Worthington make. Windlass and capstans are to be of the "Providence" kind, manufactured by the American Ship Windlass Co. The equipment also includes two stockless anchors, one to weigh about 5,000 lbs. and the other about 4,000 lbs. The distilling apparatus must be capable of furnishing 3,000 gallons of good, potable water in 24 hours. A cold storage room will contain about 1,000 cub. ft. of space and the refrigerating plant must be capable of keeping the room at a temperature of 34 deg. F. during the summer heat of the South Atlantic and Gulf of Mexico ports. The electric light plant is to consist of a direct-connected engine and dynamo, two 18-in. search light projectors, two 2,000 c. p. arc lights, sixteen 32 c. p., and 225 16 c. p. incandescent lights, as well as all switchboards, switches, lead and current wires, etc. The steam steering gear is to be of the kind manufactured by Williamson Bros. of Philadelphia. The dredge is to be heated throughout by steam.

THE "INDIVIDUAL" SHIP OWNER.

HE IS STILL IN EVIDENCE ON THE GREAT LAKES—A LITTLE BOASTING AS TO WHAT LAKE OWNERS WILL SHOW THE COAST IN THE MATTER OF HANDLING FREIGHT.

Buffalo, Oct. 10.—The report that the American Ship Building Co. has not only been able to fill all its yards on the lakes with new work that will occupy its entire time next year is now added to by the further statement that it has refused within a few days to figure on the plans for four large vessels on which early delivery was required. I made inquiry as to the ownership of these proposed vessels and was assured that they were all separate individuals, or small syndicates, and not the big fleet owners. There is an immense amount of significance in this last point, for it means that the small owner is not by any means scared by the growth of the large ownership fleets. He has not been asleep over the question either, we may be assured, for it is this very point that he has been studying on of late, probably more than any other thing connected with the lake business. He for awhile saw with alarm the effort of great capitalists and great combinations to monopolize the trade, as it appeared to him, but a later and, let us hope, more accurate notion of it is that the heavy interests went into ship building on quite a different plan. There was ore to be carried at rates so varying that it could not by any means be given a price till it was known that there was tonnage enough to carry it, and at the best there has been a great fluctuation in the value of it, mainly, in some seasons at least, on account of the lake rate of freight.

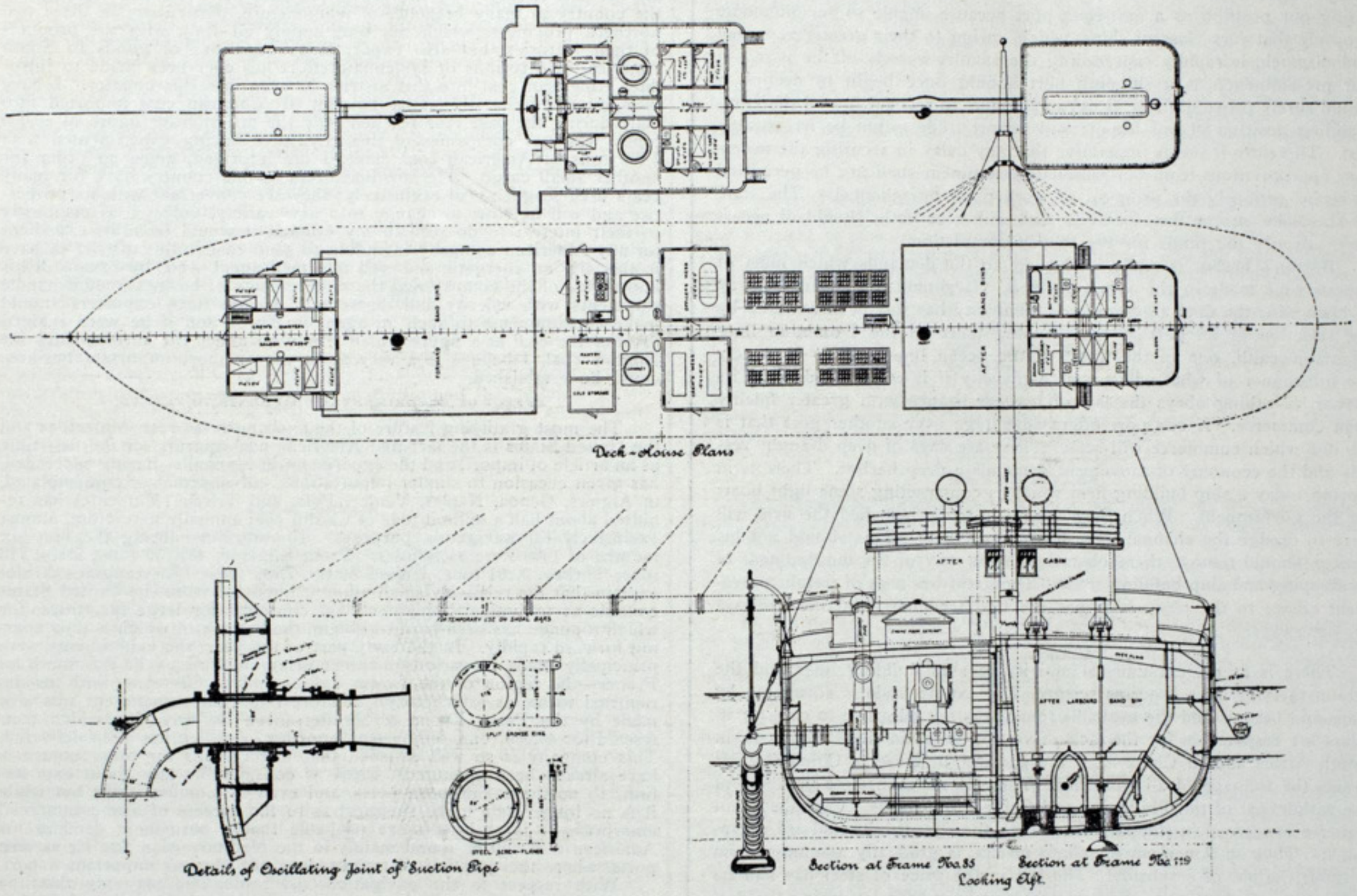
There is also report that the heavy mine owners somehow obtained the idea that they were being boycotted, and that added to the resolve to equip themselves with tonnage. The result has been a great change in the lake business, but the individual owner is for all that holding his own much better than was at one time thought possible, so that he is now feeling much better than for a considerable time past. The argument, and it is made by practically all the individual owners, is that it is the shore charges that form the problem with the big fleet, in a way that might be thought impossible at first glance. The owner of one or a few vessels finds that by close watching he can keep them moving all the time and he can get the up cargoes when there are any. One owner remarked to me lately that he had been able to get coal cargoes for his steamer every time this season, which is a remarkable thing to do these days. This is no disparagement of the larger fleet, but a showing that gives a chance for all.

Now as to building. There is no hope of assistance from the coast. The probabilities are all the other way. Sometime ago a lake vessel owner got the idea that he might be able to get work done in the coast yards that would be as cheap and satisfactory as anywhere at home and he made a trip that carried him as far as the James river, which, on account of its 18 ft. of water to Richmond, Va., ought to be about in the lake class. He came back with no sort of expectation of help there unless it might be sometime at Richmond. The coast builders readily told him what the difficulty was. Their plants are too unwieldy. To compete for big ocean liners, or even the larger tramps, immense machinery is needed. One man said that his yard was equipped with hoisting machinery adapted to many times the capacity needed on the lakes and he could not afford to build anything that kept this equipment practically idle. If it is the idea to build in sections and join them at Montreal this extra work would cost $10,000.

On the other hand, there is a much-needed class of coasters that will go through the Welland and St. Lawrence river canals, when not loaded, and when the lake ship yards find themselves coming to the end of their contracts they are going to look for more work of that class than they now have, and there is no reason why they will not get it. It will not be difficult to compete with yards that are fitted with solid cement bottoms and have every stall expensively housed in. For we have all the enterprise of the coast yards. We are going to be in closer touch with them hereafter and with the general coast business. There will be interests that cover coast as well as lake fleets before long, for some moves are already under way that amount to that now.

Then there is going to be a rattling of the dry bones on the coast shipping and handling docks right away. So long as the ocean cargo is to be carried across the ocean and possibly to China there is not much difference to the captain whether he is a day or a week unloading, but our lake owners will go into the coast trade and they will go right to hustling, just as they do at home. What would the coast handlers say to putting sixteen 30-ton cars of coal into a vessel in an hour with no trestle to chute it through? The only limit to such speed on the lakes is the capacity for trimming cargo in the hold. Every lake man who comes home from the coast docks declares that he is aching for the chance of showing them a few things. The time is about here when he is going to do it.

JOHN CHAMBERLIN.



STEEL-HULLED, SELF-PROPELLING DREDGE BENYAURD—FOR UNITED STATES GOVERNMENT.

VARIAG'S WONDERFUL PERFORMANCE

The official trial trip of the cruiser Variag, built by the Cramps for the Russian government, is regarded by them as great triumph. She has proved, as her first trial indicated, to be the fastest ship of her class afloat. Her average speed during twelve consecutive hours' trial was 23¼ knots an hour, exceeding the requirement ¼ knot, and this under adverse conditions. She put to sea on Thursday morning last at 6 o'clock, and at the end of thirty minutes she had attained a speed of 23 knots. At 9 o'clock her speed was 24 knots. In the seventh hour she went through the water at a speed of 24 1-6 knots and could have done slightly better, but was not forced. During the trial huge waves struck her bow, but did not wash more than 60 ft. Capt. Behr, who is to command the vessel when she is accepted, said that he was perfectly satisfied with her performance, that when she was at her highest speed there was not the slightest vibration perceptible, even in the turrets. While waiting for favorable weather for the trial a test of her cruising rooms was made, the result being that she could start with a full supply of coal and could cover 6,000 miles at a speed of 10 knots an hour before exhausting the supply. She is 1,000 miles in excess of the requirement.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

Published every Thursday at No. 418-19 Perry-Payne building, Cleveland, Ohio, by THE MARINE REVIEW PUBLISHING CO.

SUBSCRIPTION—$3.00 per year in advance; foreign, including postage, $4.50, or 19 shillings. Single copies 10 cents each. Convenient binders sent, post paid, $1.00. Advertising rates on application.

Entered at Cleveland Post Office as Second-class Mail Matter.

Following is an excerpt of a recent address made by the president of the Boston board of trade: "Today the largest trans-Atlantic liners cannot use Boston harbor with safety if loaded to their full capacity. Today, when in other ways our facilities are to be increased and new prospects for a greater commerce opened to us, the danger threatens of losing our position as a first-class port because unable to accommodate properly that very class of ships, which, owing to their greater economy and dispatch, is rapidly superceding the smaller vessels of the past. If our pre-eminence as a shipping port should once begin to decline it would surely prove difficult, if not impossible, to recover it, and the commanding position of our import and export trade might be irrevocably lost. Therefore it seems imperative that any delay in securing the necessary appropriations from our national government shall not be permitted to retard seriously the progress of work upon our channels. The state of Massachusetts or the city of Boston, either or both, should, if necessary, advance the funds for the speedy completion."

Boston's harbor is really inadequate to the demands which must of necessity be made in the future upon it. It should seek in every way to open wide the door to commerce. The city has just been honored by the selection of its port as the stopping place of the Dominion liner Commonwealth, one of the finest of the ocean liners. This is merely the forerunner of what will come to the city if it will only develop its harbor. Nothing obeys the law of least resistance with greater fidelity than commerce. If one port offers advantage over another port that is the one which commerce will seek. These are days of deep draught vessels and the economy of movement demands a deep harbor. There is in Boston today a ship building firm which is constructing some light boats for the government. When they are ready to be launched the firm will have to dredge the channel in order to float them. This should not be. Boston should remove these obstacles in the way of the development of its shipping and ship building trade. The great business of freight movement comes to the city which has the best terminals, whether railways or waterways.

There is at present unusual activity in ship building lines and the reason therefor is as exact as science. The export trade is advancing by leaps and bounds and the available tonnage is not adequate to care for it. Wars are responsible for the lack of vessels—wars in the Philippines, in South Africa and in China—and the greatest of these is China since it drains the tonnage of all countries. There is no immediate prospect of the withdrawal of the Philippine and Chinese transports. Capitalists, not hitherto concerned in shipping, have seen the opportunity and are grasping it. Thus an American merchant marine is gradually assuming form without the aid of a subsidy. The fall in the price of steel has had its influence upon contracts. Several contracts have been let during the past month and several more are in contemplation. The new St. Lawrence canals have made it possible for the great lakes to compete in the construction of vessels for ocean service. This form of industry will increase rather than diminish. Considering the aggregate of her resources Canada has done infinitely more for her waterways than has the United States. The present canal permits the passage of a vessel of respectable size, and if the past counts for anything the future will see the Canadian canal locks increased to such dimensions as to accommodate vessels much larger than those now passing to the seaboard. Then will the lake builders become rivals of the coast builders in earnest and have a hand in every undertaking of magnitude. Indeed, as it is, the lakes are introducing American vessels upon the high seas in sufficient number not to be sneezed at.

There is no law, however beneficient, but works a hardship somewhere; no revolution of world-wide benefit but what grates harshly upon some individual. At present it is the towing companies and the southern pilots that feel the pitiless heel of progress. Hitherto all cotton went abroad in sailing ships. The steamers which at present touch at Savannah carry five times as much cargo as the ordinary sailing vessel, and, moreover, they require less handling. Cotton is going abroad in steam vessels. Consequently the patronage of the towing companies is sadly falling off. A steamer requires pilotage only, while a sailing vessel requires not only pilotage but towing in and out, and frequently shifting charges. The principal product sailing vessels now carry from Savannah is naval stores, and even with this commodity they are not without competition from the steamers.

AMERICAN COAL ABROAD.

CONSULAR AGENTS SHOW THAT THE MARKET IS A SMALL BUT A GROWING ONE—SPECIAL REPORTS SECURED BY THE STATE DEPARTMENT.

The fact that latterly some little coal has been sent to England from the United States, and a more considerable quantity to other European countries, has caused the state department of the United States government to make a systematic inquiry through its consular agents regarding the foreign market for coal. Following are some of the reports received:

ONLY A SMALL BEGINNING IN ITALY.

Italy having no native coal fields, is necessarily dependent upon foreign countries for its supply and has heretofore obtained practically the entire amount from England. The scarcity of coal during the past year has probably not been felt more severely in any country of Europe than in Italy, and in no part of Italy more seriously than in the province of Piedmont. This province and the adjoining one of Lombardy are the principal manufacturing centers of the kingdom, and hence require a greater quantity of coal than is needed in the agricultural districts. During the past twenty years, wonderful progress has been made throughout the country in many branches of manufacture, particularly in these two northern provinces, which not only supply all Italy with the products of their factories, but also export large quantities of goods to South America. No serious or systematic effort has ever been made to introduce American coal into this district or even into this country. I have been informed that the entire amount of American coal imported into Italy during the past year reached only the insignificant figure of 40,000 tons. The gas companies of this city, after having experimented with 1,000 tons of American coal, have, I am informed, given an order for another small cargo. The manufacturers in this country have for many years used English coal exclusively; they are conversant with its properties and will be slow to change to a new variety, unless it is manifestly to their interest to do so. In my opinion it would be most expedient for any American company intending to send coal to this district to have in this city an energetic and well informed agent who, by reason of his knowledge of the country and the requirements of business, could handle shipments with celerity and discretion. If American exporters should make consignments to such an agent in Turin, and if he were enabled to offer the coal at a figure which would be under the current rates for English coal, I believe in a very short time a most important business could be established.

EFFECT OF EXPERIMENTAL SHIPMENTS TO FRANCE.

The most gratifying feature of the exchanges between Marseilles and the United States is the fact that American coal appears for the first time as an article of import, and the experiment in Marseilles having succeeded, has given occasion to similar importations, either actual or contemplated, in Algiers, Genoa, Naples, Venice, Pola, and Trieste. Marseilles has required about half a million tons of Cardiff coal annually heretofore, almost exclusively for navigation purposes. Importations during the first six months of 1900 were as follows: From England, 457,750 tons; Italy, 713 tons; Turkey, 5,201 tons; United States, 7,739 tons. These figures do not explain that the relatively small amount imported from the United States consists of preliminary shipments on contracts for large quantities, for which tonnage has been hard to obtain, the balance of which is now coming forward rapidly. In the early part of the year the experiments were principally made in various manufacturing institutions in the south of France—the region of the Lower Loire—and in Germany, with results reported to me as satisfactory. A more important experiment was also made by the Paris, Lyons & Mediterranean Railway Co., which contracted for 40,000 tons, only a small portion of which has been delivered. This company is so well satisfied that negotiations for other contracts have already been instituted. There is considerable talk about exportations to northern European ports, and even to London itself; but while it is no longer safe to be skeptical as to the success of any commercial enterprise, it is at least more probable that a permanent demand for American coal will be found mainly in the Mediterranean and far eastern ports, where the question of freight does not play so important a part.

With respect to the navigation-coal trade, one may say that the year 1900 has been a period of experiment, likely to be followed by importations of real importance from the United States during the year to come. An actual contract has been made by the Compagnie des Messageries Maritimes for 10,000 tons of New River coal, and trials of this same coal are to be made by the Peninsular & Oriental, Bibby, Orient, British India, Alfred Holt and other less well-known companies. At Havre the Compagnie des Chargeurs Reunis has received one cargo of Eureka and one of New River coal; and at Amsterdam, notwithstanding its proximity to England, the Stoomvaart Maatschappig Nederland has purchased a small lot. Las Palmas, Rio de Janeiro, Buenos Ayres, and the ports of the Antilles may be said to be buyers of American coal under such circumstances as to permit of no doubt of the permanency of the demand from those quarters. So hopeful is the outlook in Marseilles that the Hudespeck Transatlantic line, with headquarters at Richmond, Va., has been organized to provide regular sailings from Newport News to Marseilles, touching also at Naples and Genoa, as occasion may require. Sailings every three weeks have been contracted for, and coal is to be brought on when other cargo does not offer. Return cargoes of iron ore from Huelva, Spain, will be relied upon.

On Aug. 1 Cardiff navigation coal cost the dealers in Marseilles 31s. ($7.52) and Pocahontas, 27s. 6d. ($6.68). This is on a basis of freight from Cardiff at 10s. 6d. ($2.55), and from Norfolk, 17s. 6d. ($4.25). The dealers here claim that this apparent difference in favor of American coal is reduced to not over 3s. (73 cents), because of the increased cost of handling American coal. The Cardiff coal is so large in size that the best lumps may be used to construct retaining walls on the quays when the cargoes arrive. American coal is so small and friable that this can not be done, and to store it properly retaining walls must be built of large baskets filled with coal. In passing, I may say that on every hand I am assailed with comments on the comparative smallness of our coal. Cardiff navigation has been so long and so favorably known in this market that another product is immediately considered in comparison with it, and in appearance, at least, the importations from the United States have been inferior. Under easier market conditions we would have a much more

difficult time in selling our coal, because of this criticism. I know of a number of small consignments of coal—notably those brought over from New York in lots of 500 and 1,000 tons to complete cargo—which were found to be so unsatisfactory upon arrival that the consignees finally disposed of them by mixing them with Welsh coal, and it has been proposed to do this mixing on a very considerable scale here, unless the prejudice against small coal wears away, or American shippers find it possible to improve the character of their consignments. I am satisfied that much of this coal complained of leaves the United States in fairly good shape, but being naturally friable and shattered by powder, which is used in the United States much more extensively than in Wales, and being then shipped 5,000 miles and handled at least twice, and perhaps three times, before it is delivered into the ship's bunkers, it is reduced to mere slack when it reaches the foreign consumer.

Most of the coal being sold here to the navigation trade brings 25s. ($6.07) to the dealers, although it costs them considerably more. They are obliged to make this sacrifice, as the contract price for this year was fixed at 25s. last October. Being obliged to deliver, even at a loss, they are naturally displaying considerable energy in urging shipowners to accept American rather than Cardiff coal, but whether this enthusiasm will continue when next year's contract prices have been fixed will depend upon conditions. The owners of the principal British lines make annual contracts in London for delivery throughout the year at the various ports of call reached by their steamers. At the present time it is difficult to get Cardiff coal at all—first, because mine owners are doing their best to keep up prices; second, because there is a good demand for coal throughout Europe; and third, because British miners, benefiting by the sliding scale of wages, are less and less willing to work as the price of mining advances. Therefore, shipowners are inclined to be yielding and to accept American coal at the price they have agreed to pay for Cardiff, because they know that the coal contractors are losing money.

While the present standard of prices is unlikely to be reduced for some time the possibility of a reduction is one which should be confronted in order that we may retain the hold that we have secured upon the export trade. Cardiff coal at 21s. ($5.11) at Cardiff is about double normal prices, and the difference between the cost of Welsh and American coal at delivery ports is some 4s. or 5s. (97 cents or $1.21). A break in that amount at Cardiff would be most difficult for the American exporters to meet, under present freight conditions. When we have secured large cargo boats, or perhaps learned to utilize as coal transports the fleet of ore carriers now frozen up during the winter on our great lakes, we will have done much to save the situation. It is but a step from this consideration to that of our merchant marine, upon the building up of which the development of our coal trade depends to a large extent, not alone as a means of providing tonnage at low rates, but to consume coal when laid down in foreign ports. I leave the subject with the passing remark that France requires 42,000,000 tons of coal annually, of which domestic mines can supply but 30,000,000.

GREAT BRITAIN.

During the past few weeks, the continually increasing prices asked per ton for coals in this country have been a subject of daily comment in the newspapers, and have caused considerable agitation among householders and manufacturers. Contracts have had to be entered into by the different railway companies, gas companies, and large manufacturers for a supply of coal at prices in some cases nearly double, and in others more than double, those ruling a twelve month ago. The coal owners openly admit that they intend forcing prices higher and higher, and claim that they are in a position enabling them to dictate terms. To the householder the matter is as serious as to the manufacturer. Present prices are not far short of those ruling last winter, which in turn were very much higher than in previous years; and it is stated that the prices during the coming winter will rise to 50s. and 55s. ($12.15 to $13.36) per ton. How great an increase this is will be apparent when it is remarked that the average winter prices in past years (excepting, of course, when strikes or other circumstances forced the price higher), have been from 25s. to 30s. ($6.08 to $7.30), the latter figure having been looked upon as exceptionally high. In consequence of the present condition of affairs, various concerns have been publicly mentioned which claim to manufacture fuel from sewage, Thames mud, etc., and place peat on the market at prices exceedingly moderate. There is no doubt their commodities have a large sale. An interesting development is announced, the London Daily Express publishing an article under date Aug. 16, relating to the arrival in the Thames of the steamship Queenmoor with a cargo of American gas coal, and commenting upon the possibility of the American coal miner being able to successfully compete with the British. Following is the article:

"Last evening there steamed up the Thames the ship Queenmoor, bringing for the first time in the history of the world a cargo of American coal to London. This seems rather a sweeping statement to make, and it might be necessary to qualify it by admitting that American coal has of course come to the Thames as part of the necessary equipment of steamers crossing the Atlantic, but it is certainly believed that the Queenmoor's cargo is the first ever brought for sale to English buyers. The Queenmoor has brought neither steam coal nor domestic coal, but gas coal—a description of the mineral which has unaccountably been lost sight of in all the discussions of the coal question. There has been a struggle between British producers of gas coal on the one hand and the consumers of gas coal on the other, and the arrival of the Queenmoor with a consignment of 3,000 or 4,000 tons for a great London gas company is the highly significant sequel. Up crops at this juncture the important question: Can American coal be brought to London to compete in price and quality with British coal? Upon the first point it is sufficient to say that everything depends upon the price of coal in England. The average price of coal in the port of London today is 23s. ($5.58) per ton. Inquiries show that with the freight added to the original cost in the American market, coal cannot be delivered here from the other side at less than 27s. ($6.55) per ton. These figures indicate that for the present Uncle Sam has no particular footing in any market on this side of the Atlantic. But it must be remembered that the British coal owner and merchant have coolly proposed to double the price of home gotten coal, especially during the coming winter. Obviously, if British coal is to go up to 46s. ($11.75) or even 40s. ($9.72) per ton, America can undersell it, and this opens up immense possibilities which there is no necessity to discuss now. There are, however, two points to be considered, one of which tells in favor of America and the other against. The first is that the coal resources of the United States are enormously greater than any which can possibly exist here. The American coal fields range from the well-known unlimited deposits of Pennsylvania as far southward as Virginia. Consequently, America can afford to export coal to an extent beyond calculation. On the other hand, there is a second point—the question of transport. Practically all the coal must be sent across the ocean in British ships, and, moreover, those ships will very shortly be occupied in freightage, which has been the subject of long standing contracts, for the transport of enormous quantities of wheat and cotton. The harvests of both these commodities are close at hand, and it is difficult to see how vessels can possibly be spared for the conveyance of coal.

"All things considered, it does not seem likely that there is any immediate danger of a coal invasion of England from across the sea to any considerable extent. On the question of quality, America can undoubtedly hold her own. Her coal fields produce alike steam, house and gas coal in unlimited quantities. Her coal contains a smaller percentage of carbon than the best British average, and gives a heat power of 15.5 lbs. to the pound of coal, as compared with over 16 lbs. in English coal. If pit mouth rates and freights could therefore be suited to the exigencies of competition, America has little to fear on the score of quality. The main point, of course, is how the incursion of American coal into the British market is likely to affect the latter in the future. American coal has been brought in as a weapon with which to decide the eternal dispute between the British producer and consumer, and who knows what influence that weapon may have upon the final issue? The presence of the first American collier in English waters affords much food for reflection. Further facts which may come out shortly will throw a vivid light upon the question."

NETHERLANDS.

I am glad to be able to report that American coal is beginning to find its way into the Netherlands. The first shipload of American steam coal was brought to Rotterdam per steamship Dutch Prince on Feb. 27 last, for account of Messrs. Rings & Co., ship brokers; and the first shipment of anthracite coal, also 500 tons, arrived last week from Philadelphia per steamship Glanton, to the firm J. & C. Harrison, Limited. Besides these two shipments, 2,000 tons of steam coal have lately been imported from the United States, and I am informed that more shipments are to follow. If it had not been for the high ocean freight rates which have prevailed during the Transvaal war—ranging from 15s. to 20s. ($3.64 to $4.86) per ton—I have no doubt that a great quantity of American coal could have been sold in the Netherlands during the past six months, and as soon as freight rates return to their normal average, American coal will undoubtedly find a good market at this great seaport.

NAVAL NOTES.

The battleship Massachusetts will be laid up at the League Island navy yard, it having been decided that it is unwise to begin extensive repairs on it at this time.

Naval Constructor J. J. Woodward has been relieved from duty at Newport News, Va., and ordered to duty in the bureau of construction and repair in Washington.

The battleship Texas is about to be passed upon by a board of survey at Norfolk, to determine whether it is worth while to spend any more money on this obsolete type of ship. If the overhauling can be brought within reasonable limits it is probable that it will be authorized, but if the sum required is large the vessel, practically, will retire from service.

Torpedo boats building for the navy are behind time. The contract period expired long ago and the navy department extended the time of completion for one year, on the representation of the contractors that they could not obtain the steel. The situation has apparently but little improved and it is probable that the time will have to be again extended.

The gunboat Vicksburg was floated upon the blocks in the dry dock at Charlestown navy yard last week and will have her composite bottom cleaned and her hull above the water line painted. Her under-water valves are also to be put in good working order. The principal changes necessary to get this ship ready for her new duties are to be in the fittings of her interior; she has been used and fitted out as a gunnery training ship and it will be necessary to change the quarters for officers and crew.

The naval board, which is inquiring into the question of removing the naval station from Port Royal, has not agreed yet upon a report. It is understood that the inquiry as to Charleston has narrowed the question of sites down to two, and that the board is likely to present the merits of both of these sites, with an expression of preference for one of them. This will leave the navy department free to make the final selection, and is intended to obviate the possibility of combination or increase of price by those interested in the successful site.

One of the results of the recent maneuvers at Newport is a report to the navy department by Capt. Folger, in which he recommends that each battleship be provided with picket launches for defense against submarine torpedo boats. He was greatly impressed by the performance of the Holland, and speaks of the important part the submarine boat will play in future naval operations. He thinks the only danger that the submarine boat will experience will arise from the possibility that she will be run over by a hostile or friendly ship. Lt. Com. Mason, in charge of the Holland, has recommended that she be kept constantly in commission to prevent deterioration. He also recommends that the experts furnished by the company to assist the naval crew be withdrawn, as the officers and men are now competent to handle the vessel.

In view of numerous inquiries on the subject the navy department has authorized the statement that up to date there has been no distribution of bounty money to the officers and crews of the American fleet which destroyed the Spanish fleet off Santiago. The matter has been pending in the court of claims, and while bounty money has been allowed, it has not yet been determined as to what the amount of the individual allowances shall be or whether the allowances shall be determined by the court of claims or the navy department. Moreover, even after these questions have been determined it will be necessary to secure an appropriation by congress to enable the payments to be made, so that it will be several months at least before these can begin.

IN THE ENGINE ROOM OF THE DEUTSCHLAND.

The following very interesting account of a visit to the engine room of the Deutschland (37,000 H.P.) was written by a correspondent of the Scientific American, who also made some notes of the recent record-breaking passage of that vessel:

"The outward voyage was noteworthy for the high average speed maintained, 23.36 knots an hour, the high average horse power developed, 36,913 for the whole voyage, and for the fact that the passage was the shortest ever made between any points in America and Europe, the time from Sandy Hook to the Lizard being 5 days 7 hours and 38 minutes. The return journey, in view of the highly unfavorable weather conditions, was even more remarkable; for, although head winds, varying in strength from 7 to 11 out of a possible strength of 12, with exceptionally high seas, were encountered on the first four days of the trip, the run from Cherbourg to Sandy Hook was accomplished in 6 days and 33 minutes at an average speed of 21.16 knots an hour.

"The eastward record was rendered spectacular in the public eye by the fact (purely accidental, as it happened) that the Deutschland was scheduled to sail one hour later than the Kaiser Wilhelm, whose fastest record of 22.79 knots an hour had been accomplished on her last eastward run. Twenty-two and a half hours after starting, the Deutschland was abreast of the Kaiser, and she continued to add to her advantage at a remarkably even rate of one knot per hour. A visit was made to the engine and boiler rooms while the two vessels were abreast in the so-called race, and at a time when the Deutschland's engines were indicating between 37,000 and 38,000 H.P. everything was quiet and orderly. The temperature in the stoke holds and on the lower engine room platforms was but slightly above the normal of the atmosphere, and this in spite of the fact that coal was being consumed in the 112 furnaces at the rate of 572 tons per day, and that steam at 213 lbs. pressure was being expanded in the twelve cylinders of the twin, quadruple expansion engines at the rate of 178 tons per hour. No clearer proof of the fact that steamship designing, as carried out in a first-class establishment, is an exact science, and ship building a perfected art, could be asked for than was presented by the utter absence of excitement or evidence of unwonted effort in the engine and fire rooms of this fine vessel under circumstances where such excitement would have been expected and natural. That a 23,000 ton Deutschland with 37,000 H.P. would overtake and pass a 20,000-ton smaller edition of herself with 28,000 H.P. was a foregone conclusion, provided, at least, that the safety valves were just lifting at the board of inspection pressure of 213 lbs. to the square inch.

"Steam is led to two 36⅝-in. high pressure cylinders which are placed in tandem above two 108¼-in. low pressure cylinders, the total height from the lower platform to the top of the high pressure cylinders being 45 ft. It then passes to a 73⅝-in. first intermediate, then to a 104-in. second intermediate, and finally to two 108¼-in. low pressure cylinders, from which it is led to a surface condenser with 21,315 sq. ft. of cooling surface. There is thus quadruple expansion in six cylinders, acting on four cranks, the two intermediates being above the two outside cranks, and the four high and low pressure cylinders driving the two inside cranks. All the reciprocating and rotating parts are of massive proportions. Thus, each low pressure piston weighs 7 tons, the piston rod 3 tons, and the connecting rod 10 tons. The crank shaft is 59 ft. 3⅜ in. long, of 3 ft. throw, and weighs just under 100 tons. When it is remembered that each of these mammoth engines runs at the exceptionally high speed of seventy-seven to eighty revolutions, and that the piston speed runs up as high as 1,040 ft. per minute, it can be understood that a view of the two engines from the amidships bulkhead doorway, when the ship is at full speed, is profoundly impressive. The cut-off for the high pressure cylinders is at 73 per cent., for the two intermediates at 70 per cent., and for the two low pressure cylinders at 62 per cent. Bearing in mind the high initial pressure, the late cut-off, the length of the stroke and the high piston speed, one can realize how the unprecedented indication of 36,913 H.P. for the whole voyage could be accomplished.

"The total coal consumption for twenty-four hours, including the auxiliaries, was 572 tons, which works out at the highly economical figure of 1.45 lbs. per horse power per hour. This high economy is due in general to the all-round excellence of the boilers and engines, but particularly to the Howden forced draft with which the boilers are fitted, in which the air supply to the furnaces is raised by the heat of the escaping furnace gases from 70 degrees to 270 degrees Fahrenheit before it enters the furnace, the temperature of the uptake being lowered by a corresponding 200 degrees Fahrenheit.

"On the return trip to America the Deutschland received the first real test of her capabilities in varying conditions of wind and sea, and the result proved that, given a vessel of sufficient strength, weight and power, the full strength of an Atlantic gale is powerless to stop her. Leaving Cherbourg at 6:40 P. M. on the 17th ult., she at once encountered a fresh wind and rough beam sea, in which an average of 22.1 knots was maintained for seventeen hours, or until noon of the 18th. In the next twenty-four hours the vessel made 440 knots in squally weather and a very rough sea, despite a lengthy detention while steaming in a circle and lowering a boat in search of a seaman who had been carried overboard. On the 19th the wind increased to a strong gale, the rollers meeting the ship on the port bow. For six hours it blew with a strength of 10 to 11 out of a maximum possible rating of 12, and the ship maintained a trifle over 20 knots against what the ship's log designates as a 'strong gale, with long, heavy rolling sea, and irregular high swell,' the crests of the rollers making a clear sweep of the forecastle deck and falling in a magnificent cascade far to leeward. It was only after the seas had torn loose an iron ladder and twisted the railing of the forecastle deck that the engines were slowed down to 13.5 knots, at which speed for four hours the ship rode easily across the seas without the least suggestion of a roll. The utter absence of rolling in a quartering sea of such proportions was surprising, for in the height of a gale in which the St. Paul had to turn and run before the seas for five hours, it was not necessary to place the racks upon the table at the lunch hour. On this day the ship ran 502 knots, an average of over 20 knots an hour. On the following day the vessel made 573 knots, and on the last day over 600 knots, although, owing to an error of calculation, the run was given as only 581 knots.

"It is inevitable that the development of 37,000 H.P. on the propellers of such an elastic structure as the hull of a 700-ft. liner should result in a certain measure of vibration. This vibration is not due to defective balancing in the engines, which are built on the Yarrow-Schlick-Tweedy system, but is probably inevitable when two propellers are each expending 18,000 H.P. upon the water. We very much question whether the application of turbine propulsion will remove a difficulty whose source evidently lies elsewhere than in the engine room."

FINE COLLECTION OF MODELS.

Few ship building firms in the United States possess so large or valuable a collection of models as that which ornaments the walls of the office of Arthur Sewall & Co., in Bath, Me. These models serve as an object lesson, showing as they do the many changes which the styles in vessels have undergone in the last seventy-five years. In the early years of the century vessels were comparatively small, with round, full bows, heavy quarters and full run. Compared with ships of today they were clumsily built, were dull sailers and though safe were uncomfortable sea boats. Up to about 1837 they had flush decks, the cabin and crew quarters being under the deck. The galley or "cookhouse," as it was then called, was a six-by-six box lashed abaft the foremast. About that time our ship builders adopted the topgallant forecastle, which was soon followed by the deck house, a square structure, built on the open deck near the stern of the ship covering the gangway leading to the cabin and used as a dining room for the captain and officers during fine weather. The vessels in the coasting and Cuba trade ranged from 20 to 100 tons burden. They were single deck with a high poop, under which were quarters for the officers and crew. They were large carriers for their tonnage and were excellent sea boats, but very dull sailers.

The first improvement noticed in marine architecture was in the fishing fleet. The square stern was adopted, the bows were built on sharper lines and the breadth of beam was increased, making them better boats and swifter sailers. Then the coasting trade began to feel the need of a better class of vessels. The high poop deck (so called) of lighter construction than the other parts was built over the main deck, from the stern to the mainmast, and surrounded by a light but strong open rail. Eventually these light decks were extended to the top gallant forecastle, thus making the vessel practically double decked. These improvements had the effect to spur up the inventive genius of the ship builders and naval architects, and it soon became apparent in the many new departures from the old existing types, in the improved models and greater tonnage. The ship builders rapidly increased the tonnage of their ships built for the foreign trade. In 1841 the Rappahannock, registering 900 tons, was built by the Sewalls and was the wonder of the world as being up to that time the largest ship ever built for the merchant service. She was another departure from previous models. Her cabins were built on the upper deck and were lofty and spacious and were fitted up in a style previously unknown. She was what was then known as "frigate built," a round bilge, tumble-in topsides and very wide double channels.

During the 40's the ships built were considered models of strength and beauty. Their large poop cabins were fitted up with an elegance and a view to comfort never before attempted on a sailing ship. Their gracefully flaring bow, their true sheer and light counter were distinctly American. But they were built expressly for capacity, not speed, and it remained for the exciting news of the discovery of gold in California to stimulate the genius of our naval architects, and the result was the American clipper of the 50's, one of which, the Flying Cloud, made the passage from New York to San Francisco in eighty-two days and her time has never been beaten. But these magnificent ships soon proved to be not exactly what was wanted, and at once our ship builders turned out the medium clipper, a ship combining the qualities of large carrying capacity with speed, safety and comfort. These clippers were very sharp at the bow and some of them were so much so that every plank was put on without once resorting to steaming. The coming of steam vessels into the foreign trade drove the builders into continually increasing the carrying capacity of their ships, and the sharp lines had to give place to more rounding ones which, while they tended to decrease the speed, materially increased their capacity, and today we still see another change, that of building ships of steel instead of wood.

NEW DRY DOCK AT SAN FRANCISCO.

The proposed new dry dock to be built at Hunter's Point, in San Francisco harbor, will be operated by the San Francisco Dry Dock Co., which has taken over all the dock interests of the old California Dry Dock Co. These include an existing dry dock, in dimensions: Length, 490 ft.; beam, 125 ft.; depth, 24 ft.; also two floating docks of 3,000 tons and 1,200 tons capacity, respectively, and a marine railway capable of handling any vessel up to 800 tons. The new dock will be excavated in the solid rock, which at the Point is green serpentine. The plans call for a dock 750 ft. long, 122 ft. wide at the coping, 74 ft. wide at bottom, 32½ ft. deep over sill below coping, and with 28 ft. of water at high tide. In dimensions, therefore, the dock will be one of the largest in existence. Concrete will be used for the interior facing of the dock, and granite for the approach and seat for the caisson. The keelson and working floor will be of Douglas fir well anchored and embedded in a sub-floor of concrete. The entrance to the dock will be closed by a steel floating caisson, which measures, length 104 ft.; beam, 28 ft.; depth, from bottom of keel to underside of upper deck, 33 ft. 9 in. Wharf approaches on either side of the entrance to the dock will be constructed by piling, and will be about 200 ft. long and 60 ft. wide. The pumping plant will consist of three centrifugal pumps, each having a 38-in. discharge. The combined capacity of these pumps is 110,000 gallons per minute. They will be arranged with double suctions, so that they can empty both or either of the dry docks. Two hours is the estimated time for emptying the new dock, and forty-five minutes the old one. Three Corliss engines, 24 in. by 48 in., and each of 345 H.P., will operate the pumps by the rope drive, the engines being located on the surface and the pumps in a pit on a level with the bottom of the dock. Steam will be supplied by six water tube boilers, and there will also be a 75 H.P. donkey boiler for furnishing steam to the drainage pumps and power capstans. A brick stack 110 ft. high and 7 ft. inside diameter, will be put up on the boiler house. The officers of the dock company are: President, William Babcock; vice-president, J. H. Meyer; secretary, W. F. Russell. Howard C. Holmes is the engineer in charge of the work.

OLD WHALING DAYS.

John Fordham, the blacksmith of Sag Harbor, whose shop is the first building as one goes up from the steamboat dock does all manner of iron work for shipping, but is particularly noted for his eel spears, clam rakes and shark hooks, which have made him famous throughout the United States. In his office there are samples of these specialties—shark hooks with huge barbs and two or three feet of steel chain attached, which look as though they might hold any leviathan; eel spears nearly a foot in diameter, consisting of a flat central prong and four round ones on either side, blunt at the point, but furnished with sharp barbs used for spearing eels in the mud, and when thrust down the blunt points pass on either side of the eel, but in withdrawing it the barbs transfix him and haul him up. Mr. Fordham also makes a large two-pronged spear for spearing alligators, which is sold extensively in the south. Pointing to the shark hooks, Mr. Fordham said: "I sent fifty of them to the Brooklyn navy yard the other day for use on the cruisers. The demand for them is always larger than the supply." In his youth Mr. Fordham was employed in doing iron work for the whaling ships, and has interesting reminiscences of the stir and bustle that then pervaded the town.

"I remember," he said, "when black, bull-bowed whale ships lay three abreast along yonder dock, and eight hundred coopers, riggers, sailmakers and stevedores went to and from the wharves to their work morning and evening. In cellars along shore thousands of barrels of oil lay piled tier on tier and covered with sea weed. Yonder were great warehouses, three stories high, their upper stories filled with spermaceti and whalebone, the lower used as sail lofts and rigging lofts, and cheek by jowl with them were long cooper shops and here and there a ship chandlery or candle factory. The bosom of the bay was covered with lighters, piled high with products of the whale coming from ships at anchor and returning with provisions and outfits. An army of carts were moving oil and bone from the docks, the cooper's adze and the blacksmith's hammer made merry music all day long, and the streets were filled with crews of incoming and outgoing vessels, attended by their wives, daughters, sisters or sweethearts, making a strange jumble of welcome and farewell, smiles and tears, weeping and laughter.

"There were four great mercantile firms in the village in my day—say 1830-45—whose ships sailed to every sea where a whale was known to spout—Howell Bros. & Hunting, Mulford & Sleight, Charles T. Deering and H. & S. French—but most of the sixty-four whalers that then sailed from the port were owned by stockholders—one share to a holder perhaps. Almost every man of the crew owned a share, and the rest of the shares were distributed among the merchants, the widows and orphans of dead whalemen and townspeople generally, so that when a home coming whaler was reported there was not only a personal but a financial interest in her voyage that sent every one who could go to the docks to greet her crew and learn of the success of the venture. Few whalers were built especially for the trade in those days. They were mostly stout packet ships, which, proving slow sailers, were sold to our people for whaling ventures. Sometimes it was an old craft that had become unsafe for passenger service, like the ship Thames, that carried the first missionaries from this country to the Sandwich islands, and whose bones now protrude above the sands of the bathing beach yonder, or the packet Cadmus that brought Lafayette to this country in 1824. These vessels were of course overhauled, put in ship shape, refitted and sent out on voyages of from one to four years' duration. At first the whalers cruised near home, in the north and south Atlantic mostly, but as the whales, hunted so remorselessly, forsook their favorite cruising grounds and withdrew to the South Pacific and the ice bound fastnesses of the Arctic, their voyages were extended until they embraced the circle of the globe.

"A favorite three years' voyage, about 1845, was, first to the Azores, thence to St. Helena and down the west coast, doubling the Cape of Good Hope and through the Indian Ocean to Australia, thence to the North Pacific, and then south through the islands of the Polynesian archipelago to Cape Horn and home. The first vessel to make a long distance whaling voyage sailed from Sag Harbor—a fact, I think, not generally known. She went to the South Atlantic and returned in a few months with not enough oil to pay expenses. She had discovered enough, however, to induce owners and men to try again, and this time the ships returned with full holds. Stonington and New London, Nantucket and New Bedford, almost opposite, took their cue from this, and soon had hundreds of ships in those seas. The industry was at its best, say, in 1845—after that it declined rapidly, owing to various causes, chiefly the scarcity of whales and the fall in the price of oil, following the introduction of kerosene. In 1845 this village had sixty-four ships scattered over the globe. I have myself seen fourteen lying at the dock or in the bay at one time discharging cargo or waiting to do so. Here is a copy of the Sag Harbor Corrector of Saturday, May 24, 1834. Note in its ship news column the arrival of three whale ships in one day. I will read you the notice of these arrivals. They bring back the atmosphere of the day far more effectively than will anything I can say:

"May 20—Ship Neptune, J. Parker, from South Atlantic, with 1,800 barrels oil and 15,000 pounds bone, to S. & B. Hunting & Co.

"April 14—Latitude 4 degrees 36 minutes south, longitude 23.56 west; spoke the Ensign brig Alice, J. Hepburn, master; fifty days from London, bound to Sidney, New South Wales. May 4, latitude 21.40 north, longitude 56.10 west; schooner Alonzo of Newburn, twenty-one days out; same day brigantine Alvira, Herriman, twenty-one days from Boston for St. Thomas, etc.

"Sunday—Arrived ship, Hannibal, Squires, from South Atlantic, with 1,350 barrels of whale, 23 of sperm oil and 9,000 pounds bone, to S. & B. Hunting & Co.

"Jan. 20—Latitude 41 south, longitude 3:30 west; spoke ship Gem, Rogers of Sag Harbor, with one whale.

"March 30—Left at St. Helena ship Favorite, Hathaway of Fairhaven, with 1,050 barrels whale, 23 sperm, to sail in ten days for the coast of Africa. Capt. Hathaway reported ship Gem of Sag Harbor, Feb. 14, latitude 43 south, longitude 5 west, with ten whales.

"Same day, arrived ship Phenix, Mercator Cooper, master, from South Atlantic via Capetown (Cape of Good Hope), sixty-six days, with 2,000 barrels oil (150 sperm) and 14,000 pounds bone, to L. D. Cook and others.

"Captains, mates and crew all sailed 'on the lay'—that is, for a certain share of the cargo secured. This percentage varied with the different merchants and captains, but as a rule the captain received one-sixteenth, the mate one-twenty-fourth, the boat steerer one-nineteenth, and ordinary seamen one-one hundred and tenth. The remainder belonged to the owners who for their part furnished the ship and bore all the expense of outfitting. This was an admirable system, since it gave every man an interest in securing a big catch. A feature of it not so admirable was that of 'advances,' in which the owners advanced the men clothes, tobacco and money often to the value of the probable catch, and which was later a source of friction between the owners and the men when pay day came, often claiming that they had been swindled by the merchant. It was no light job to fit out a whale ship in the forties. First the sails, then the running rigging and boats were inspected with the greatest care, for on these depended the safety of the vessel and crew, and, of course, her success. This little book contains the instructions to the rigger who fitted out the bark Pacific in 1852 for a three years' voyage. I find he is ordered 'to have yards all up to topmast heads, spare spars, if any, on deck, jibboom rigged in, anchors on bows, both chains on deck and forward to windlass or between windlass and bow, rigging all overhauled, mizzen rigging all new, including backstays; all head rigging new, also foretopmast and topgallant stays.'

"This done the captain picked out his crew of twenty-two men, aiming to get the most expert at his command, and ranging the country from Montauk to Shinnecock for them. The crew was a motley lot when gathered—whites, Indians, half-breeds, negroes, but they were picked men. To complete the outfit there was to be provided three boats, with tubs, harpoons, lances, linces, hatchets, spades, etc., with from two to three thousand barrels well seasoned and a great variety of provisions and miscellaneous stores.

"A whaler's home-coming from a three years' voyage was an event. As soon as she was sighted down the bay a pilot boat would put off with the owners and friends of the whaler's officers on board to meet and welcome her. Meantime the news would spread through the village, and as the vessel drew up to the dock the latter was often black with the friends and neighbors of the crew gathered to welcome them. It was not always all rejoicing, though, for often the story told in the Columbia's log book was repeated of some fine fellow in his youth crushed in the whale's jaw or dying of fever on board. There were some remarkably lucrative voyages made, as there were many that brought loss to the owners. For instance, the Thomas Jefferson, gone but a year, brought in oil and bone worth $132,000. She cost her owners $17,000 and netted them that year $40,000. The ship Hudson, gone just seven months, thirteen and one-half days from her dock without sighting land meantime, brought back 2,400 barrels of oil. The Cadmus did as well. The Pacific, before referred to, was very unfortunate at first, so much so that it was difficult to get the best men to ship in her, but retrieved her fortunes in the end. On her first voyage her captain died at Pernambuco, Brazil, and the mate brought her home. On the second she got as far as the Pacific without sighting scarcely a whale, and was there dismasted by a typhoon and returned empty. On her third voyage she netted her owners $7,000. There was great fluctuation in the price of oil and it was difficult to know just when to sell. Take the case of the Flying Cloud, owned in Sag Harbor, which was sent to New Bedford for a market. Arrived there her owners were offered 72 cents a gallon for their oil, but refused it and sent it to England, where it netted them after nearly a year's delay just 26 cents per gallon."

THE MARINE ENGINE, PAST, PRESENT AND FUTURE.

I recently took a trip on one of the Fall river steamers plying on Long Island sound between New York and Fall River, Mass. Being always interested in machinery, and particularly in the steam engine, I embraced the opportunity to visit the engine room and see the immense beam engine which propels the vessel. It was an impressive sight to see the giant crank swing around in its circle with such ponderous force and to also watch the immense walking beam oscillate in its trunions far overhead. The engine of this boat is a compound, the high and low pressure cylinders being connected to the same walking beam. The stroke of the low pressure piston, which is connected to the outer end of the beam, is probably about 10 ft., while that of the high pressure piston is somewhat less, as it is connected to the beam nearer the fulcrum. The immense A frame, made up of steel plates riveted together like the members of a bridge, helped to complete the impression of great power and massiveness of design. But impressions and facts are sometimes different. Not long ago I was in the engine room of the largest ocean steamer afloat, the Oceanic, and there saw one set of engines which drive the twin screws. They are triple expansion engines and have four cylinders, the low pressure cylinder being divided into two on account of the great diameter necessary if it were concentrated in one, and also to get a more constant forsion effect on the shaft. Since the combined power of the propelling engines of this vessel is about 28,000 H.P., the power of this one engine was probably six or seven times that of the beam engine referred to, but it was not nearly as impressive in its general appearance. The short stroke, the connecting rods, the general compactness of the whole engine was in striking contrast to the old-timer, and what a difference in power per unit of space required. The beam engine monopolizes a large part of the most valuable space of the vessel, and develops a low ratio of power as compared to the modern vertical tandem engine, thanks to high pressure, high piston speed and generally greater efficiency of the latter. It sometimes appears to me that while the pioneers in steam engineering are deserving of the fullest measure of praise for their work, they apparently tried to see how much metal could be used in an engine, seemingly being under the impression that massive construction and roundabout methods of transmitting motion increased the effectiveness of the machine in some mysterious way. The future designers will point to the much better and simpler methods which to them are so plainly evident, and which at that time will be incorporated in their general practice.—A. F. Canot, in Steam Engineering.

The Russian naval estimates for the year 1901 provide for an expenditure of 97,097,666 roubles (about $74,000,000). Of this sum 16,000,000 roubles are to be devoted to strengthening the fleet, 2,000,000 are to be expended on the harbor works at Vladivostock, and 3,000,000 are assigned to improving the defences of Port Arthur. The estimates exceed those of 1900 by 10,500,000 roubles.

DESCRIPTION OF PARSONS' STEAM TURBINE.

Both the Viper and Cobra, British torpedo boats, have been fitted with Parsons steam turbines and the rates of speed which have been developed have astonished the naval authorities of the world. Both boats have attained a maximum speed of over 40 miles an hour. The application of the turbine to larger vessels is now a subject of consideration. From letters patent issued to Mr. Charles A. Parsons, the inventor of the turbine, the following description is taken:

In steam turbines as at present constructed certain difficulties are found in effectively reversing the direction of the rotation. In one method of reversing, already adopted by one of the present applicants, a special set of reversing jets and blades is applied to a marine steam turbine, and when it is desired to reverse the engine the steam supply is cut off from the main turbine and sent through the reversing blades or jets only. This

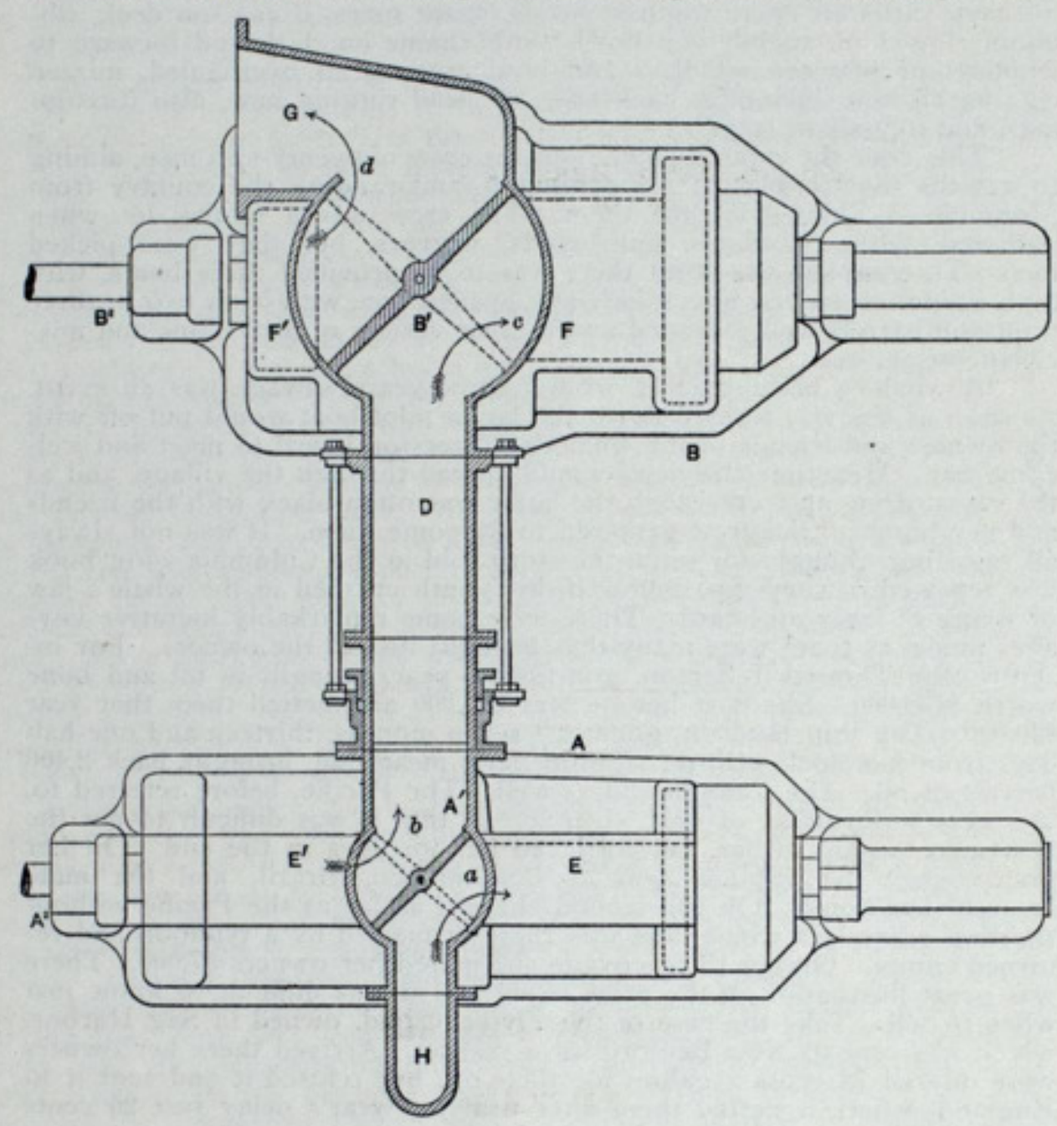


Fig. 1.—Sectional Plan, Showing Steam and Exhaust Valves

device enables the turbine to be reversed; but the reversing power is not great, as it is impossible to use any great number or series of reversing turbines without increasing complexity and diminishing the efficiency of the turbine when running in its normal direction.

The object of this invention is to overcome the difficulties and complexities of the ordinary method and to obtain a powerful reversal of a steam turbine without appreciable complication of its mechanical construction. The invention consists in an improved form of turbine blade, by the use of which a turbine can be run efficiently in both directions. In Figs. 1 and 2, A is the high pressure turbine and B the low pressure. A2 and B2 are the propeller shafts driven by the turbines. The high pressure steam from the boiler is admitted to the turbine A by way of the

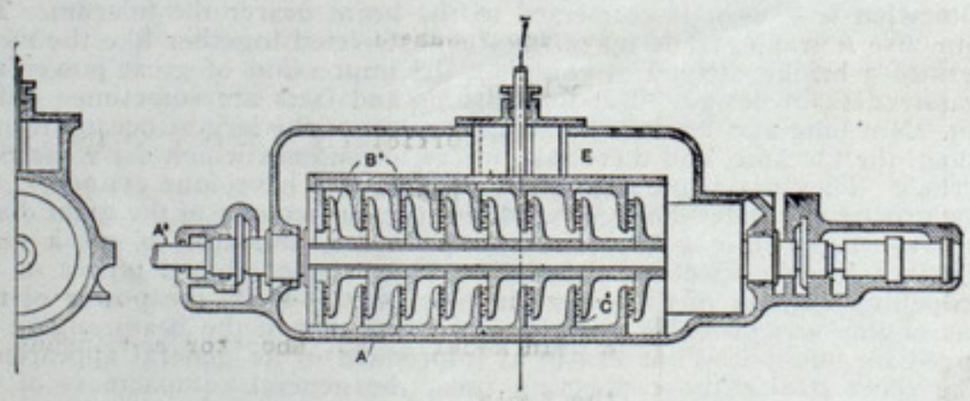


Fig. 3.—Sectional End Elevation

Fig 2.—Sectional Side Elevation.

Fig. 4.—Reversing Valve in Middle Position.

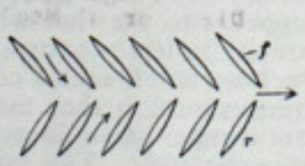


Fig 5.—Diagram of Ordinary Turbine Blades.

Fig. 6.—Diagram of Reversing Turbine Blades.

pipe H, and for going ahead the steam passes on one side of the reversing valve A′, which is of the butterfly type, to the end of the steam turbine by way of the passage E, as shown by the arrow a. The steam then passes through the various sets of moving and fixed turbine blades B4 and C4, Fig. 2, to the opposite end of the turbine, and thence it discharges to the passage E′ and passes on the other side of the reversing valve A′, as shown by the arrow b, to the pipe D, communicating with the low pressure turbine B. The steam enters that turbine by one side of the reversing valve B′ and the passage F, as indicated by the arrow c, and discharges by the passage F′ and the other side of the reversing valve B′ to the exhaust pipe G, as indicated by the arrow d. When it is desired to reverse both turbines the reversing valves A′ B′ are placed in the position indicated in dotted lines in Fig. 1, and then the steam passes to the low pressure end of each turbine and discharges from each high pressure end. When one of the turbines is required to go ahead while the other reverses one reversing valve is operated for that purpose. When it is desired to cut one turbine out of action the reversing valve of that turbine is moved to its middle position, as shown in Fig. 4.

Fig. 5 shows a series of fixed blades f and rotating blades r of ordinary construction. These blades are moderately curved and converge

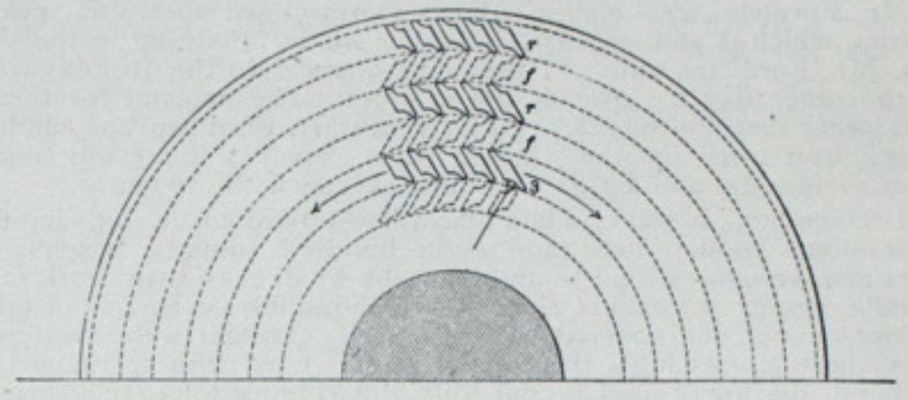


Fig. 7.—Application of Reversing Blades.

in the direction in which steam flows when the turbine is going ahead. When so rotating the steam passes between the fixed blades f in the direction of the arrow, impinges upon the concave sides of the rotating blades r, and discharges from them, continuing the direction of flow. The moving blades then rotate in the direction of the center arrow. This form of blade gives very good results when the steam passes as just described; but when the steam is caused to flow in the direction of the lower arrow, so as to reverse the motion of the turbine, it then impinges on the convex sides of the blades and travels in the direction in which the blades diverge. Under these conditions the efficiency is lowered considerably.

In order to get turbines to work efficiently in both directions we construct the blades as shown in Figs. 6 and 7. Here the fixed blades f and the rotating blades r are made with flat parallel sides, which have concavities g h, one at each end of the blade, so that the steam, whichever way it flows, impinges on a concavity. When the steam flows as indicated by the lower arrow the jet splits up when impinging on the concave surfaces g g, and the turbine rotates as shown by the arrow 3. When the flow of steam is reversed to the direction shown by the upper arrow the fluid then impinges on the concavities h, and the turbine rotates as shown by the arrow 4. By this construction the efficiency is equally good in both directions of running.

EVIDENCES OF YANKEE HUSTLING.

Mr. Loftus Cuddy, who was one of the principals of the Cuddy-Mullen Coal Co. of Cleveland before that concern sold out to the Pittsburg Coal Co. (consolidation), has about completed a tour of Europe investigating commercial condition. In an interview in London he speaks most hopefully of the revival of the American merchant marine. Up to a few years ago Mr. Cuddy's business interests were all in Canada, but he has been unusually successful in lake coal business at Cleveland. He says:

"Cleveland, Chicago, Detroit, Toledo, Lorain, Buffalo and West Superior mean to take advantage of whatever demand may arise for ocean carrying vessels. These ports are now building boats designed for both lake and ocean service. Their dimensions measure up to the full capacity of the Welland canal limitations. This canal, together with those of the St. Lawrence river, are all that prevent the lakes from supplying the Atlantic with a merchant marine large enough to ply permanently between American and European ports. When competition becomes keener, because of the construction of numerous big vessels, the lake built boats will probably be compelled to confine themselves to the coastwise trade. About a dozen of them will be sent from the lakes to the sea this winter, and more will follow as rapidly as they can be built. Wherever I went in southern Europe I saw evidences of Yankee hustling. American coal and American manufactures are forcing their way into the markets of Spain, Italy, Austria, the Balkan states and the Turkish empire. They are also entering the southern ports of the Mediterranean and reaching away towards central Asia. These are the results of painstaking and conscientious efforts to understand and gratify the wants of the people with whom the trade is being established. While it will probably be a long time before the Americans make any considerable headway towards ousting the Englishman from his own market, the latter would do well to wake up. His slow and cumbrous methods must go, or defeat awaits him. The inventive skill of the American nation is concentrated in the problem of cheapening production and distribution. Its victories along this line follow one another in quick succession. Of all peoples the Americans are the most ruthless in sacrificing machinery, however costly, the moment it loses the top notch of efficiency."

Every year for four or five years past officials of the Richelieu & Ontario Navigation Co. have talked of a couple of fine passenger steamers to meet the requirements of service between Montreal and Quebec. The latest report on this score is as follows: "The Richelieu & Ontario Navigation Co. has decided to build for the Montreal-Quebec route a magnificent new steamer after the style of those of the famous Fall River line. The boat will be about 350 ft. long, and will have 286 staterooms, which is the capacity of the Plymouth of the Fall River line, and about twice the capacity of the present R. & O. steamer Quebec. This much has been decided upon, but it is probable that the company will have to duplicate this vessel, for its experience with the Toronto, on the upper part of the route, was that tourists insisted upon traveling on the finest boat, even if it was crowded."

Capt. George P. McKay has received word that the crib for the middle ground, Pelee passage, will be ready about Saturday of this week.

OPERATIONS OF THE AMERICAN BRIDGE CO.

The American Bridge Co. (consolidation of bridge and structural iron concerns) is certainly an organization of widespread operations. This company with general offices at 100 Broadway, New York, now has works or local offices at Albany, N. Y.; Athens, Pa.; Boston, Mass.; Buffalo, N. Y.; Baltimore, Md.; Butte, Mont.; Columbus, O.; Chicago, Ill.; Canton, O.; Cleveland, O.; Denver, Colo.; Duluth, Minn.; East Berlin, Conn.; Elmira, N. Y.; Groton, N. Y.; Horseheads, N. Y.; Lafayette, Ind.; Milwaukee, Wis.; Minneapolis, Minn.; New Orleans, La.; Pencoyd, Pa.; Philadelphia, Pa.; Pittsburg, Pa.; Rochester, N. Y.; Seattle, Wash.; San Francisco, Cal.; Salt Lake City, Utah; Sidney, N. S. W.; Trenton, N. J.; Wilmington, Del.; Youngstown, O., and London, England.

This company has just begun making large shipments on account of the steel work for the subway in New York city. Already about 2,000 tons have been shipped, and the material is now being sent in at the rate of about 100 tons per day. The total contract comprises about 80,000 tons of structural material, and is being manufactured at the company's Keystone plant.

Several officials of the bridge company are now inspecting their different works. They were in Pittsburg during the early part of the week. In the party are Percival Roberts, president; W. H. McCord, vice-president, in charge of the structural department; Charles M. Jarvis, vice-president, in charge of the operating department; C. C. Snyder, vice-president and chief engineer; M. C. Christy, Philadelphia; T. P. Kennedy, Youngstown, O., general manager, and Frank Conger, Ithaca, N. Y., vice-president. It is reported by the officials that their company has just been awarded a contract for furnishing the structural material for a large Japanese arsenal to be erected at Kura, Japan.

TRADE NOTES.

A large number of steel castings furnished to the government recently by the Union Steel Casting Co. of Pittsburg have given the highest satisfaction. Among contracts lately received by this company was one for a large number of castings for the cruiser Cleveland, being built by the Bath Iron Works of Bath, Me., and a number of castings for revenue cutters 7 and 8, being built by the Wm. R. Trigg Co. of Richmond, Va. They are also furnishing castings for twenty-eight motor carriages for the army ordnance department, which are being built by the Rarig Engineering Co. of Columbus. Further work which they have on hand consists of forty-five cage stands for the Washington navy yard; a riveter frame which measures 17 ft. in the throat, this being one of three of the largest riveter frames ever built, and a lot of pipe which measures 50 in. inside diameter, together with valves for same, for the New York Ship Building Co. of Camden, N. J.

The Rescue Life Boat Co., which will manufacture the life boat invented by Capt. R. D. Mayo, has filed articles of association with the county clerk of Muskegon, Mich. The company is capitalized at $1,000,000, of which $538,000 is paid in. The stockholders are: R. D. Mayo, 27,500; Gilbert Drefell, 160; S. Davy, 80; F. J. Freeman, 300; G. L. Dressell, trustee, 3,169; F. J. Freeman, trustee, 4,200, Frankfort; D. A. McLeod, 27,500; G. A. Abbott, 10; H. J. Woods, 1, Muskegon; R. C. Miller, 10; N. T. Christopherson, 20, Manistee; J. W. Bennett, 50, Freesoil.

United States monitor Arkansas will be launched at the Newport News ship yard early in November.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of October 10, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire	33¼	33¼	32¾	32¾
American Steel & Wire, Pfd	.....	....	.....	.....
Federal Steel	34	34⅛	33¼	33¼
Federal Steel, Pfd	.....	.....	.....	.....
National Steel	26½	.....	.....	26½
National Steel, Pfd	84	84½	84	84½
American Tin Plate	32	33⅛	31⅝	31⅝
American Tin Plate, Pfd	82	.....	.....	82
American Steel Hoop	20	20	19⅞	19⅞
American Steel Hoop, Pfd	68	.....	.....	68
Republic Iron & Steel	11⅞	12⅛	11⅞	12⅛
Republic Iron & Steel, Pfd	53	.....	.....	53

Paris Exposition, 1900, confers Highest Award and 2 Gold Medals

(Only Gold Medals in this Class)

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RIVETERS
for Shipyard use
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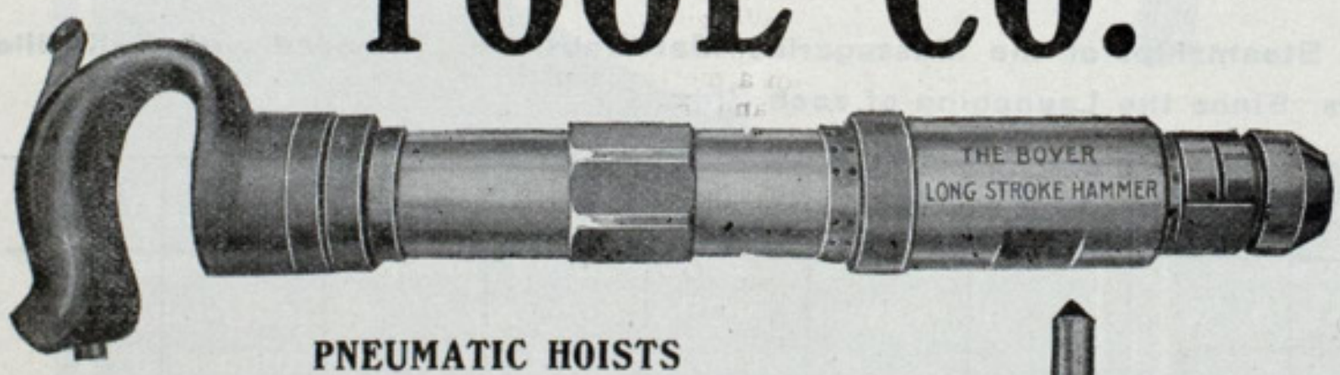
" Bridge work
" Structural work



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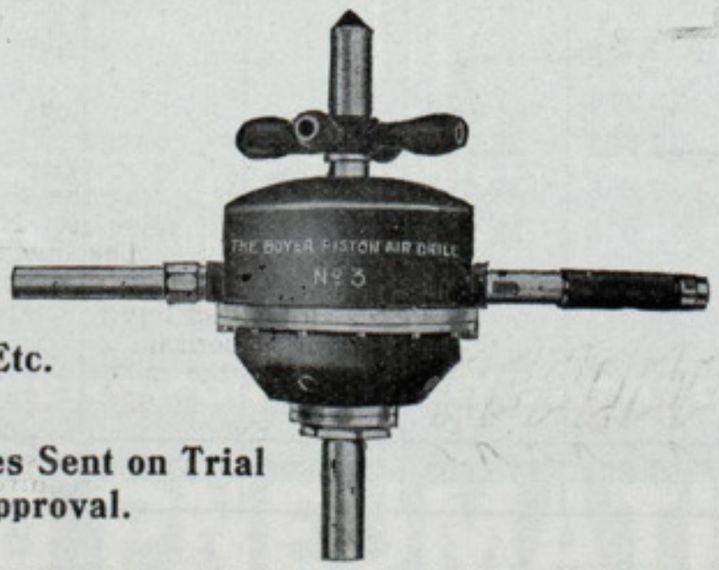
for Railroads
" Mines
" Quarries
" Foundries
" Machine Shops
" Wood boring

FLUE { Welders, Expanders, Reducers, Rollers, Cutters

PNEUMATIC HOISTS
CRANES
JACKS (Car and Locomotive)
PAINTING MACHINES
MOTORS for every use
CASTING CLEANERS, Etc.



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TO THE
PARIS EXPOSITION OF 1900

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PARIS OFFICES,
August 21, 1900.

Chicago Pneumatic Tool Company,
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Yours very truly,
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Director of Machinery & Electricity.

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WATER TUBE BOILERS FOR BIG SHIPS.

NEW HILL TRANSPACIFIC LINERS ARE TO BE EQUIPPED WITH THE NICLAUSSE TYPE OF STEAM GENERATORS—REPORTS FROM THE DIFFERENT ATLANTIC COAST SHIP YARDS.

It is understood that the two transpacific Hill liners—largest freighters in the world—now building at the works of the Eastern Ship Building Co., New London, Conn., will be equipped with water tube boilers of the Niclausse type, which are manufactured in this country by the Stirling Co. of Chicago. The number of boilers in each vessel will be about thirty-two. These boilers have proved very successful in the Russian cruiser Variag, built by the Cramps of Philadelphia, and are now being fitted in the Russian battleship Retvizan, the United States battleship Maine and the United States monitor Connecticut. They are also being used extensively abroad, and with such great success that the British admiralty recently decided to install boilers of this type on a few of its vessels, including a cruiser of 22,000 I.H.P. The Niclausse boiler has large, inclined, straight tubes. It is a quick steamer; easy to repair and clean, and any tube can be replaced in five minutes. The boiler has excellent circulation and efficiency, stows well in small space, and is of light weight.

The New York Ship Building Co. of Camden, N. J., has not started upon the laying of the keel of the steamer for the Pacific carrying trade as yet. Capt. Randall, superintendent of the ship yard, says that work undoubtedly will be commenced in the course of a few days. The first section of the keel is ready, in the shops, to be transferred to the ways, but owing to the fact that there is still work to be done on one of the ways, it was found necessary to delay the laying of the first keel at the new yard a little longer than was anticipated. The punching of plates and the other work connected with the building of the ship is being proceeded with as lively as possible. President Morse has had preserved all the punchings from the first plate for the Dollar & Co. ship and these round pieces of metal are to be dressed up and given out as souvenirs, probably upon the launching of the craft, which is to be the forerunner of a great fleet to come from the Camden yard.

The North German Lloyd liner Main, which was, together with several other of the company's ships, burned at the fire in New York some time ago, will be taken to Newport News for repairs. The Main will have to be practically rebuilt and the cost will be between $600,000 and $700,000, or nearly half the original cost of the ship, which was about $1,500,000. It will take about one year to do the work. This is the largest contract for repair work ever made by the Newport News Co. and one of the largest made in this or any other country. When the Main leaves the ship yard next fall, she will be almost a new ship, for everything above water was burned except the machinery, which, curiously enough, seems to have escaped injury almost entirely.

The sum of $72,858 will be expended at the Charlestown navy yard this month by the construction and repair department alone. It will be spent in the following ways: Repairs on the Machias, $12,000; on the Olympia, $12,000; on the Sterling $1000; on the Vicksburg, $1000; on the Amphitrite, $7000; on the Osceola, $1000. The remainder is to be used for genral repairs and construction work.

W. S. Currier & Co. having launched the Edith H. Symington at the yards, Newburyport, Mass., are at work upon a new schooner which will be launched in the early spring. Newburyport has been prominently identified with vessel building for a great many years. From the yards of the late John Currier nearly 100 vessels were launched. Currier & Townsend built the famous Drednaught.

It is reported that the Wilmington Steamship Co., Wilmington, Del., has contracted with the Neafie & Levy Co., Philadelphia, for the construction of two fast twin-screw steamboats for service between Philadelphia and Trenton.

Oct. 24 has been fixed as the date for launching the two torpedo boat destroyers which have been constructed by the Fore River Engine Co., at Weymouth, Mass. They will be named the Lawrence and the McDonough.

The Jackson & Sharp Co., Wilmington, Del., has received a contract from the Munson Steamship Co., New York, for four lighters, each 125 ft. long, 36 ft. wide and 12 ft. deep, for use in Cuban waters.

Neafie & Levy, Philadelphia, have the contract for placing the engine, boiler and joiner work in the tug Majestic, launched recently from the yards of Thos. McCosker & Co., Baltimore.

Lindstrom Bros. of Aberdeen, Wash., are negotiating for the purchase of additional water frontage so that they may be enabled to build at least a dozen wooden vessels each year.

FREE SCHOLARSHIPS.

Directors of the American School of Correspondence, 156 Tremont street, Boston, have decided to depart from custom in their policy of promotion. Believing that a personal exposition of the advantages of the school is often better than or a great help to printers' ink, they have announced in an advertisement elsewhere in this issue their willingness to grant a limited number of free scholarships to men in various large establishments and parts of the country. We are not advised as to the exact conditions, but any one who thinks he would like to have one is invited to correspond with them, giving his occupation, and his application will receive consideration by the directors.

The school calls attention to its courses in mechanical and electrical engineering, the former including steam, locomotive and marine engineering. As its work is confined to these branches they point out the probability of better work being done than would be likely where many other branches are taught.

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Grand Prix 1889 — Hors Concours 1900
Originated 1840 — Latest Improvements 1896

Number of Marine Leagues made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since the Launching of each Ship.

Year.	Australian	Polynesien	Armand Behic	Ville de la Ciotat	Ernest Simons	Chili	Cordillere	Laos	Indus	Tonkin	Annam
1890	22,576	820									
1891	22,749	22,777	68								
1892	22,749	22,801	23,274	7,753							
1893	22,793	22,781	22,762	22,749							
1894	22,813	22,789	22,858	22,813	12,567						
1895	22,891	22,922	22,913	22,936	13,629	3,571					
1896	23,178	30,906	23,232	23,183	20,735	21,051	13,572				
1897	22,750	23 202	30,912	23 185	20,745	25,370	21 119	14,382			
1898	23,646	23,178	23,184	23,199	20,842	21,080	21,080	20,851	21,318	7,569	
1899	23,178	23,205	22,477	30,135	20,082	20,926	20,956	17,448	18,285	14,669	7,628
Total	229,323	215,381	191,680	175,953	108,600	97,998	76,727	52,681	39,603	22,238	7,628

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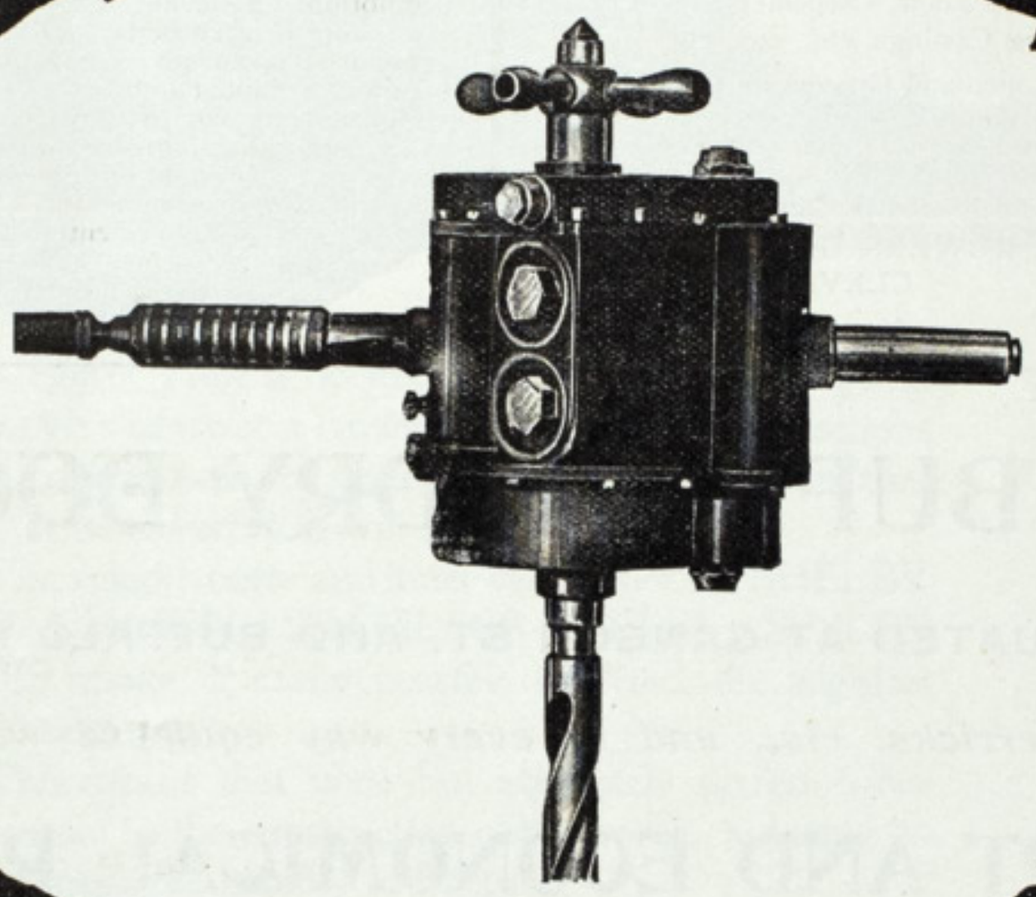

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No. 1. Weight 27 lbs., will drill up to 2½ inches in diam., ream and tap up to 2 inches.
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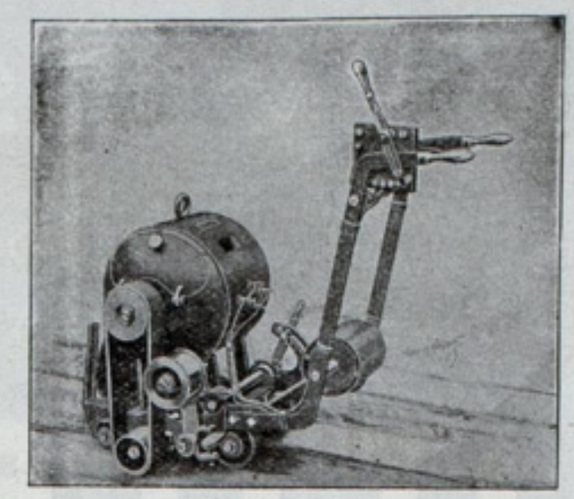

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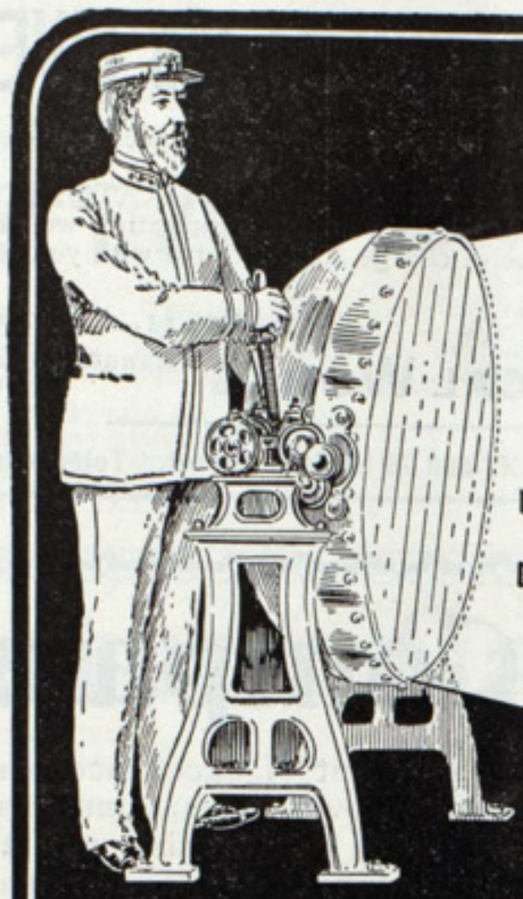

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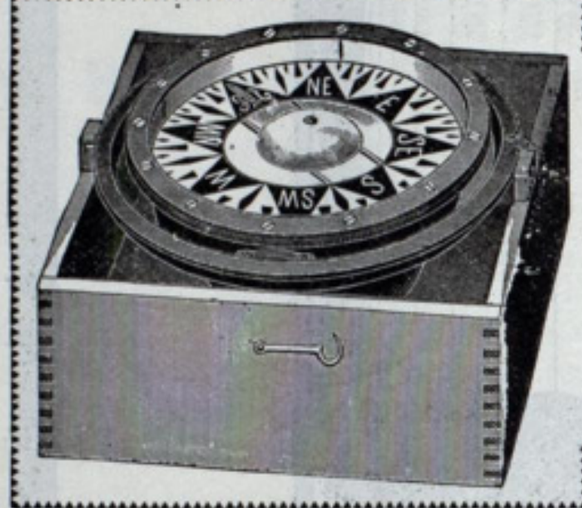

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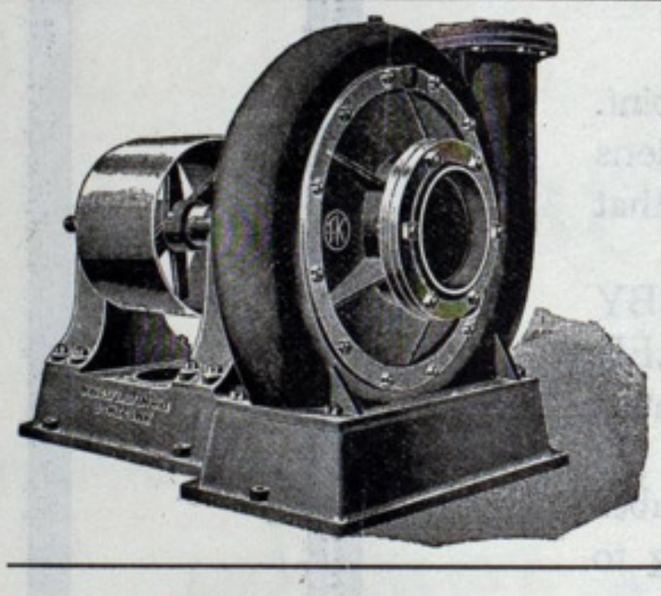

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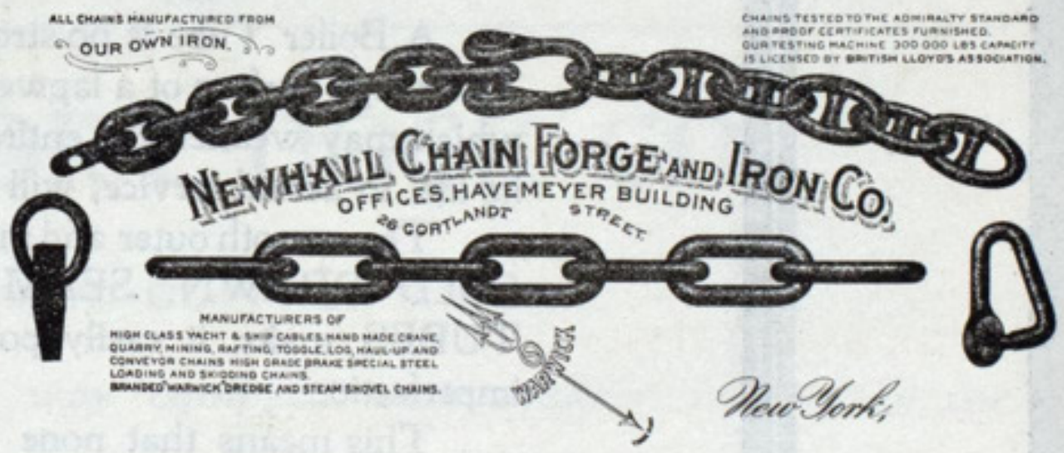

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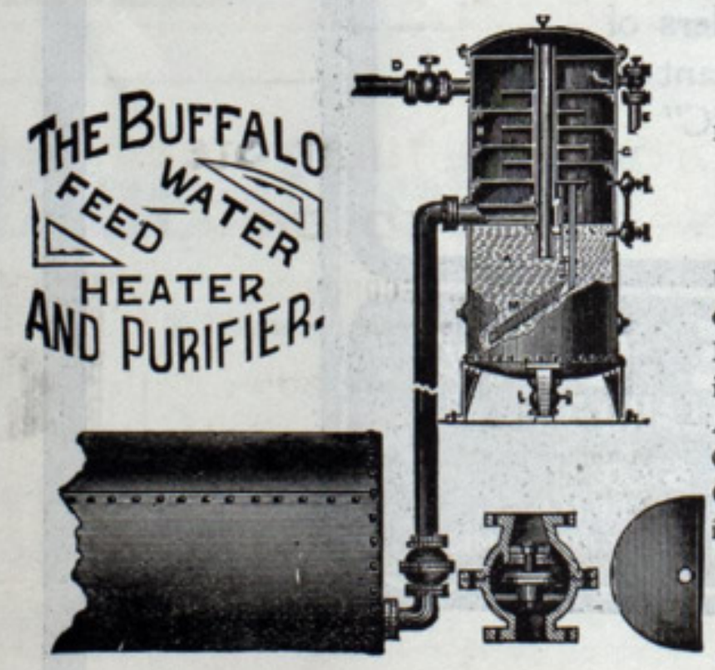

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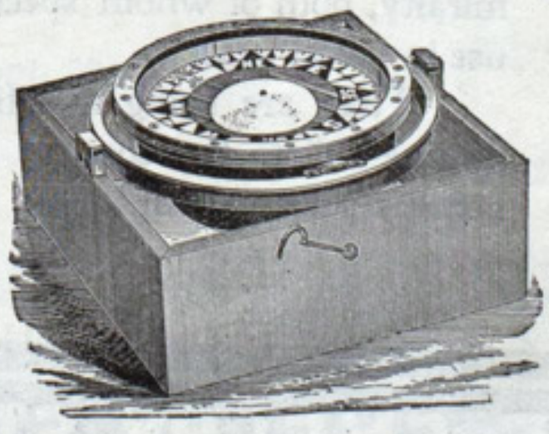

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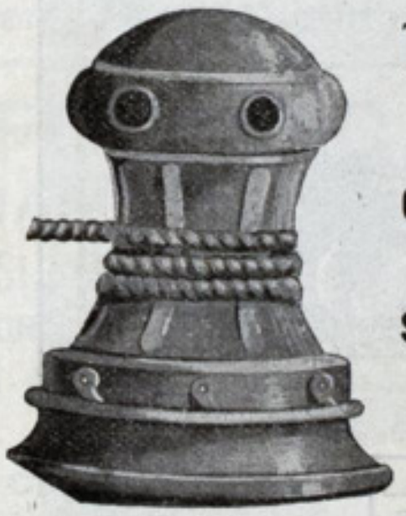

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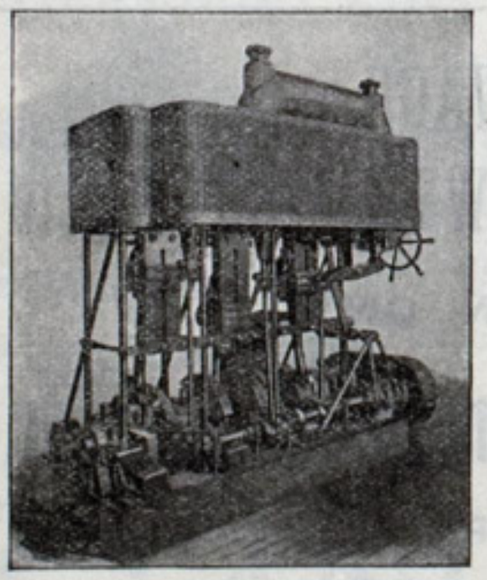

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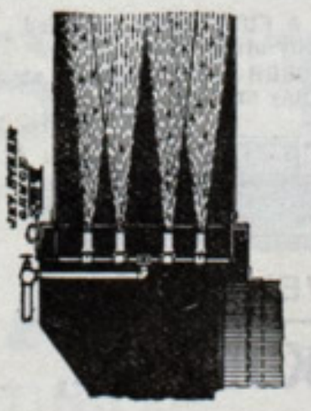

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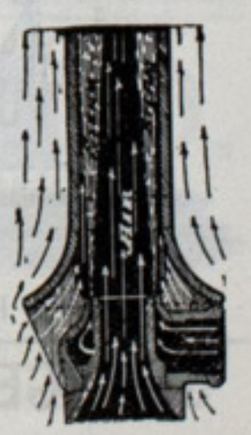

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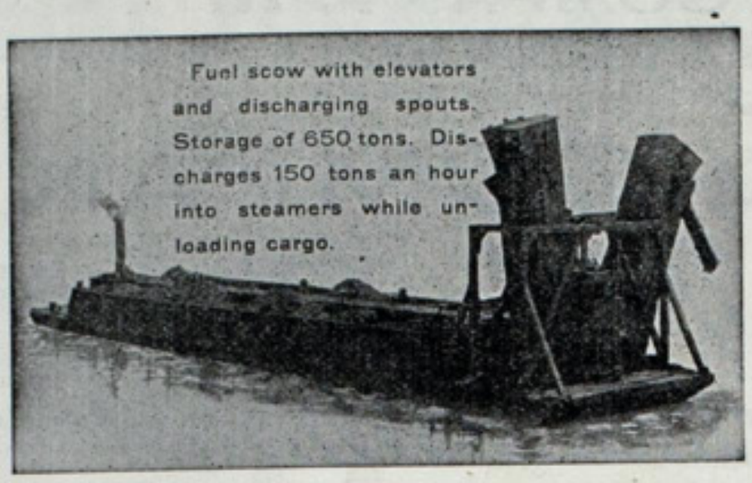

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Hodge, S. F. & Co.....Detroit.
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MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

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Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

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Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

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Great Lakes Register.....Cleveland.

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American Steel & Wire Co.....Chicago.

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American Steam Gauge Co.....Boston.
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Crosby Steam Gage & Valve Co.....Boston.

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Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

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International Correspondence Schools.....Scranton, Pa.

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Niles Tool Works Co.....Hamilton, O.

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General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

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American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

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See punches, riveters and shears.

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Bourne-Fuller Co.....Cleveland.

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American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.... ..Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.... ..New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co..... .....Chicago.

SHIP CHANDLERS.
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Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

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Red Star Line.....New York.

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Bethlehem Steel Co.....So. Bethlehem, Pa.

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Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

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Wright, Herbert & Co.....Cleveland.

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International Anchor Co.....Cleveland.

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American Bridge Co.....New York.

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Curr, Robert.....Cleveland.
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Cory, Chas. & Son.....New York.

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Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

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Helios-Upton Co.....Peabody, Mass.

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Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A..... .....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Shelby Steel Tube Co..... .....Cleveland.

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American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

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Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

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Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
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Hyde Windlass Co.....Bath, Me.
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Swain Wrecking Co.....Detroit.

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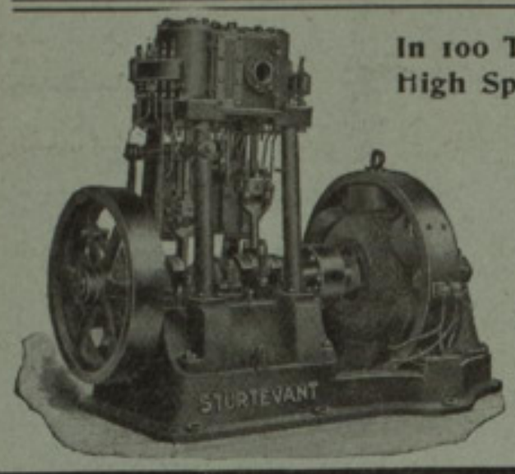

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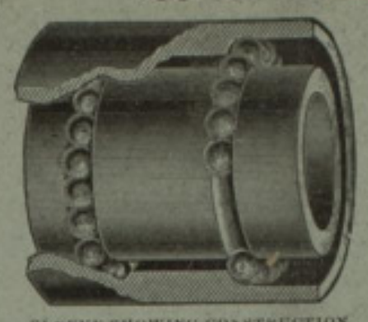

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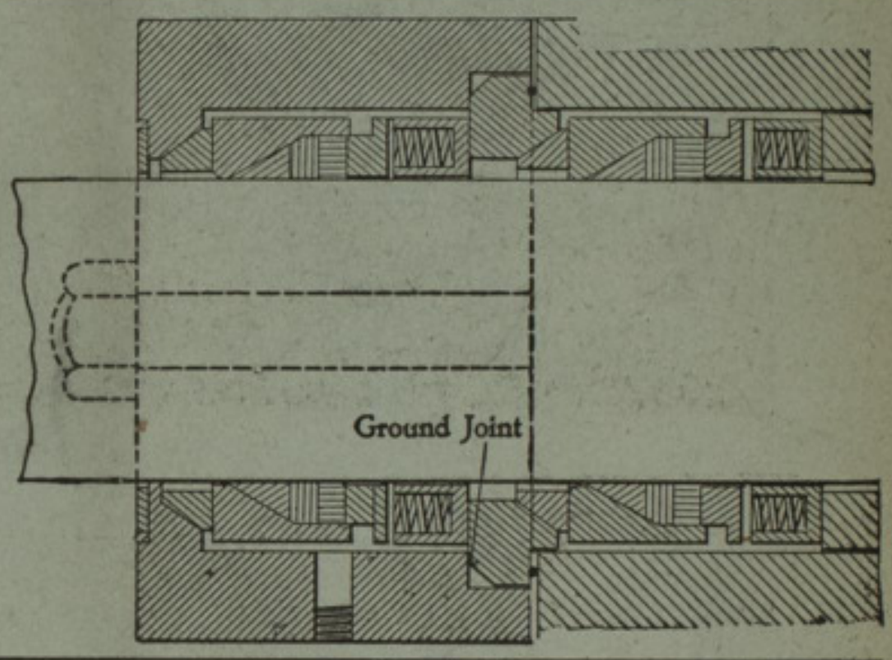

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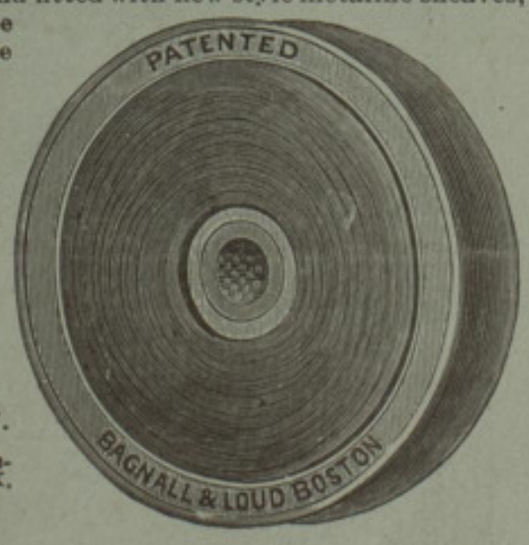

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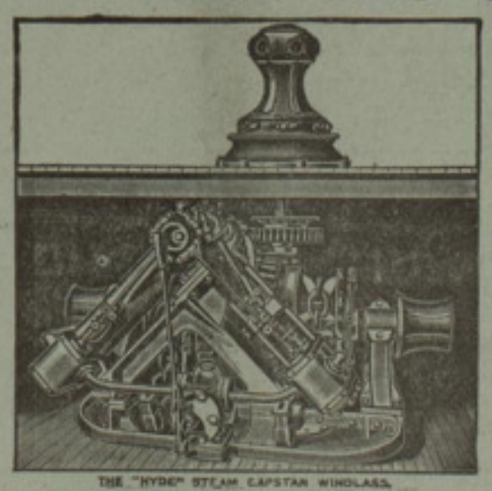

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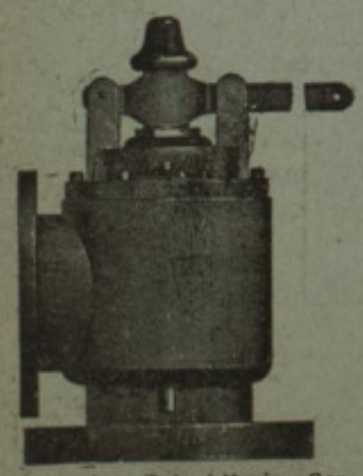

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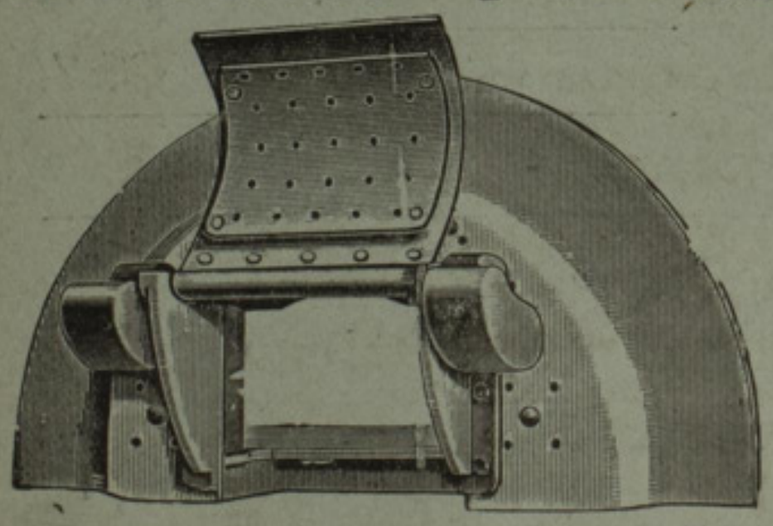

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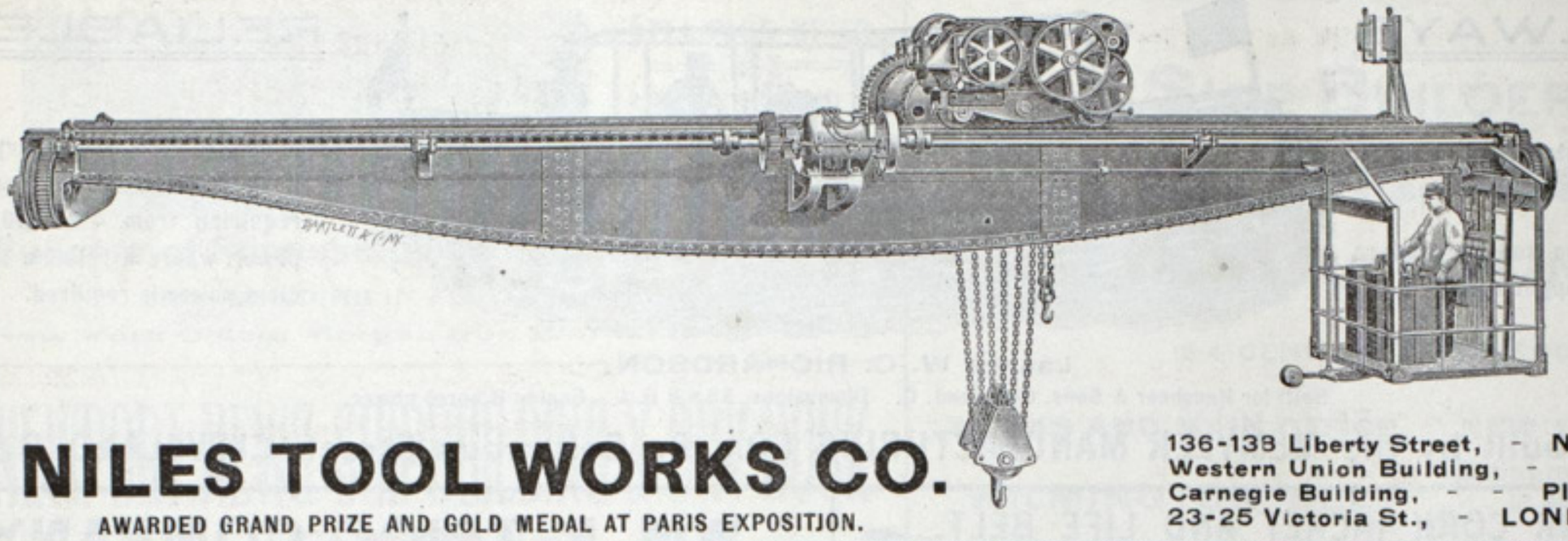

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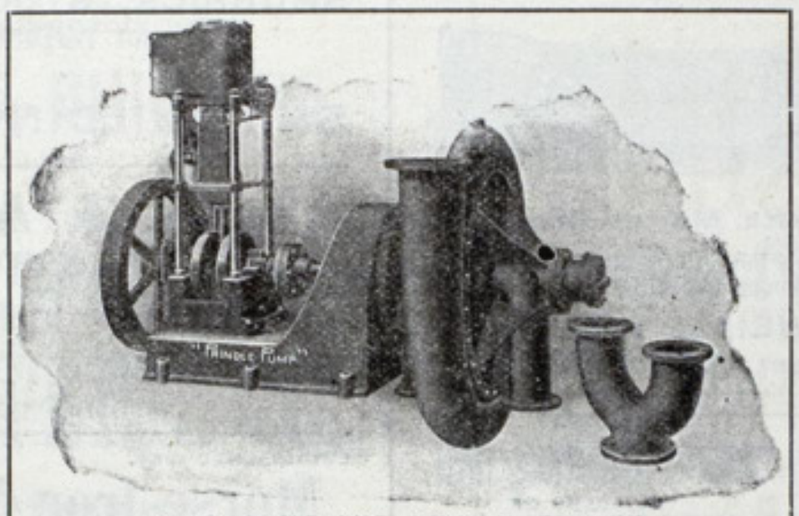

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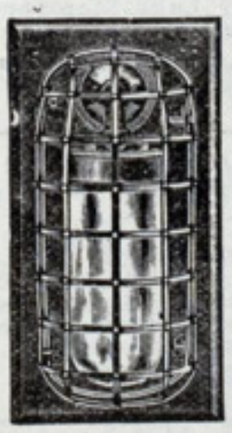

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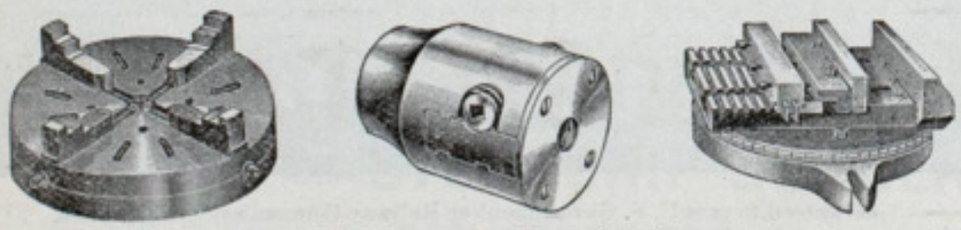

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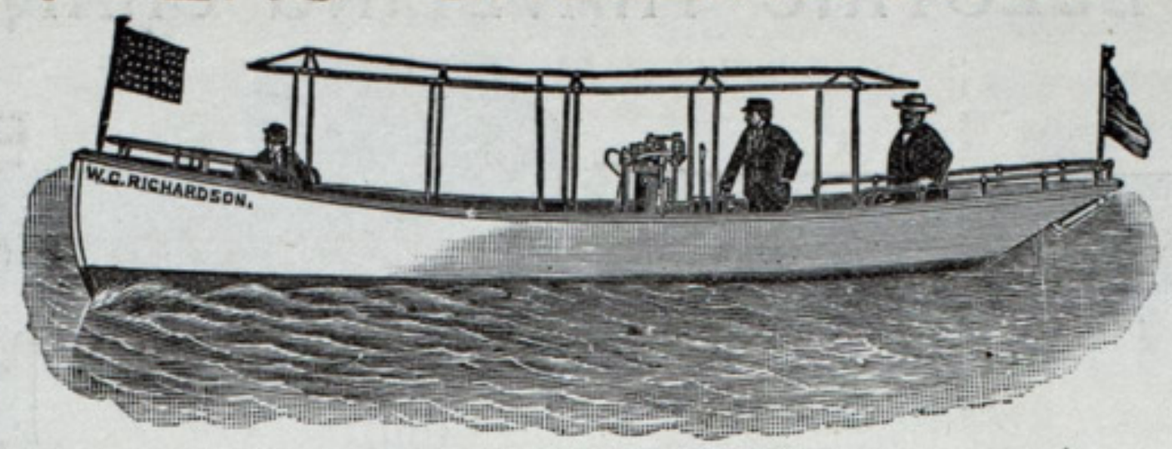

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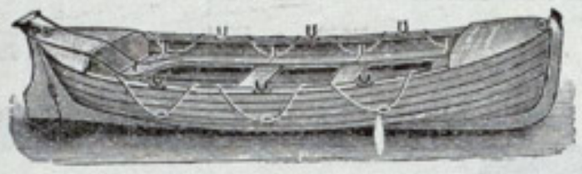

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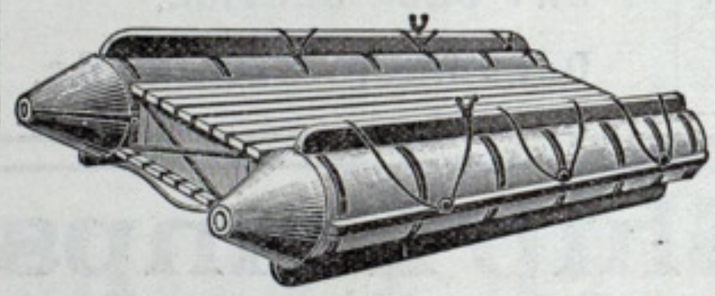

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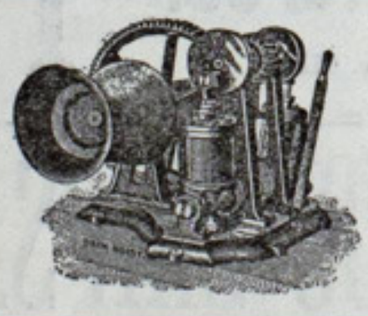

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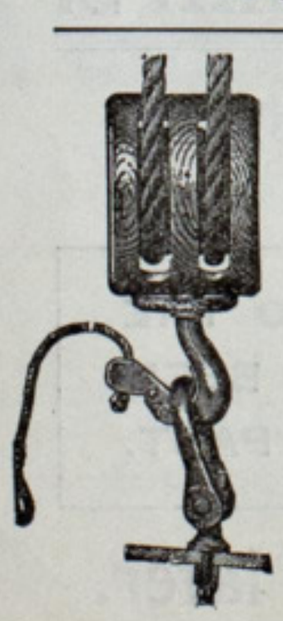

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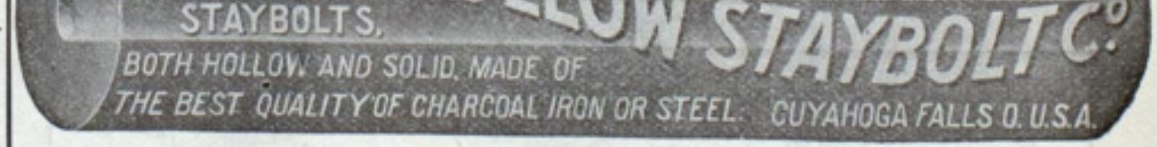

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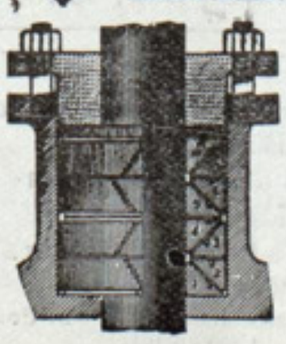

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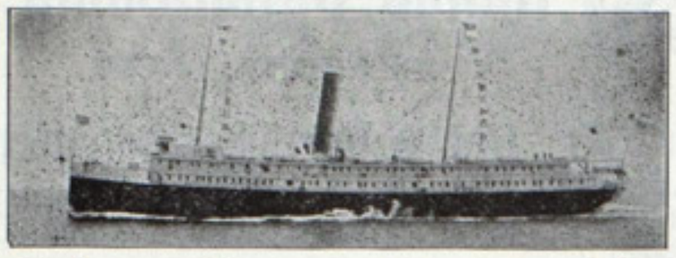

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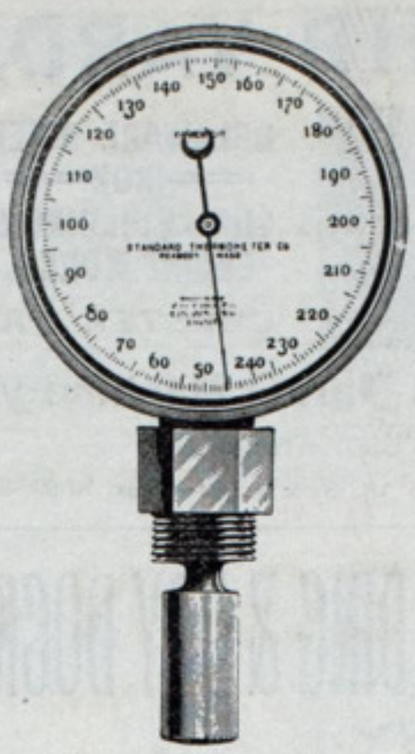

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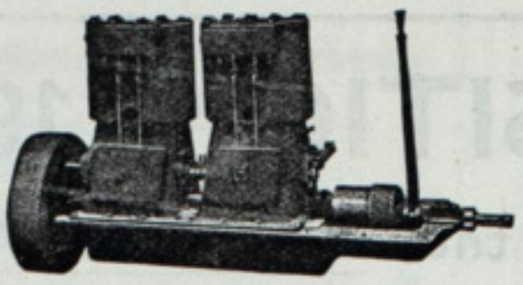

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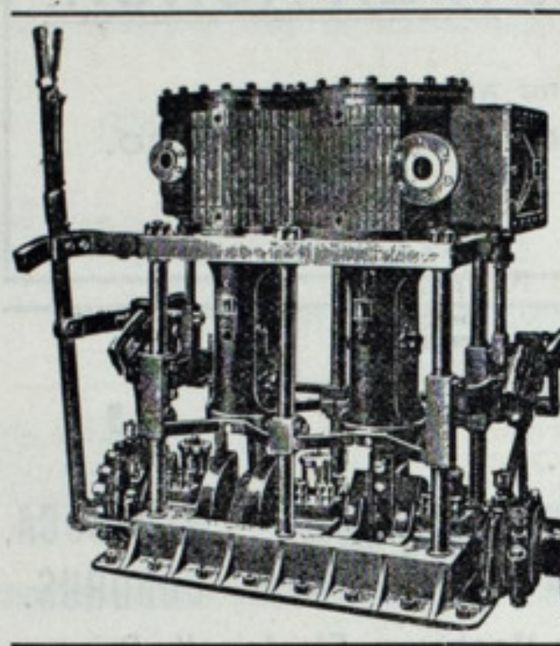

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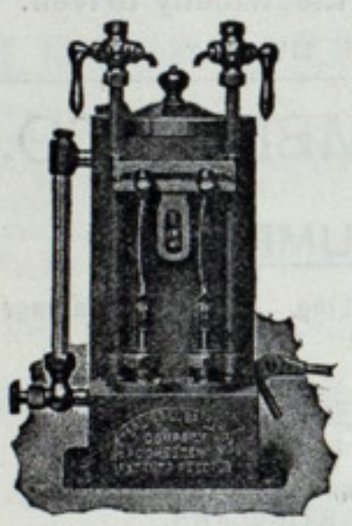

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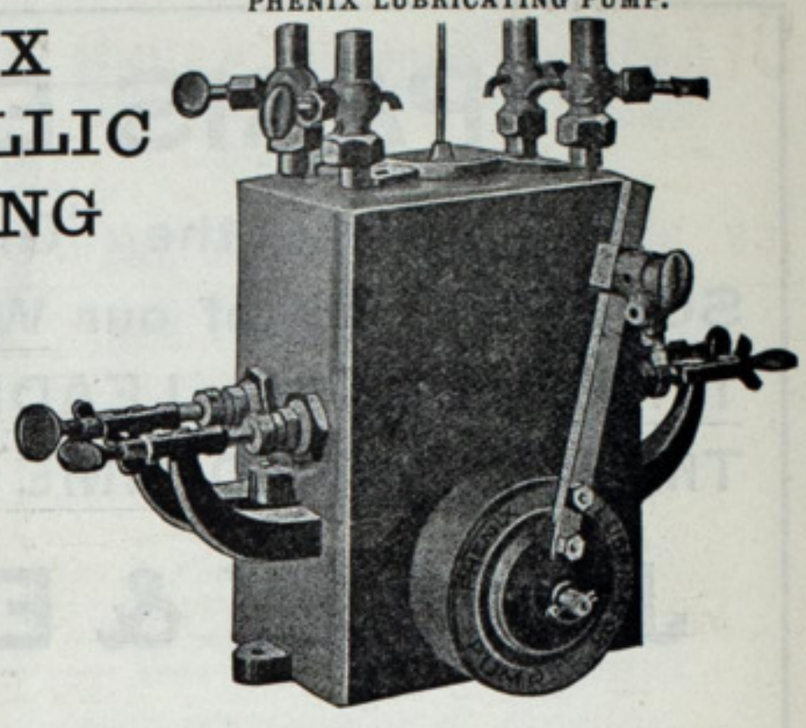

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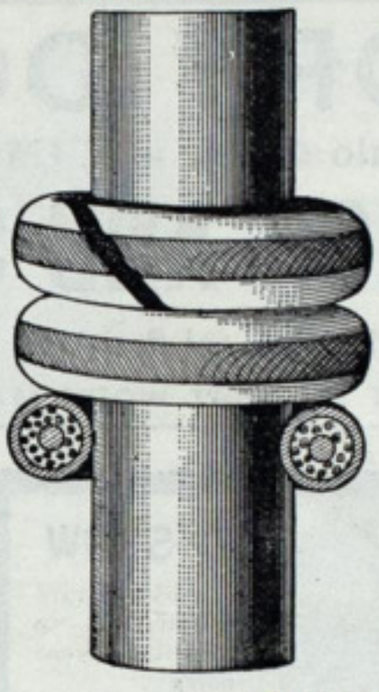

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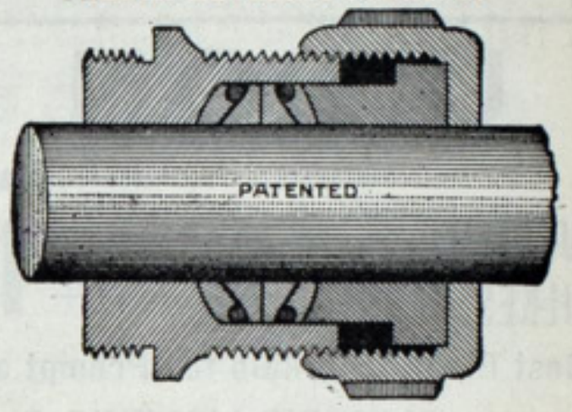

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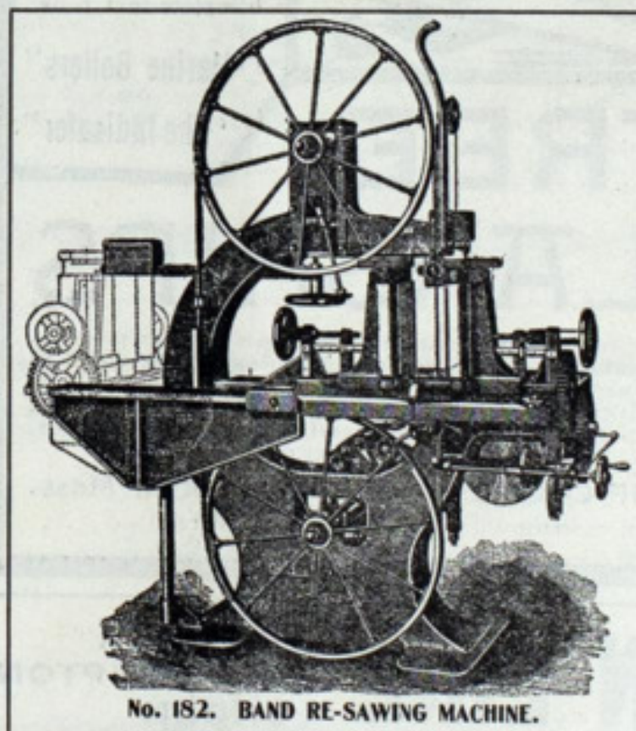

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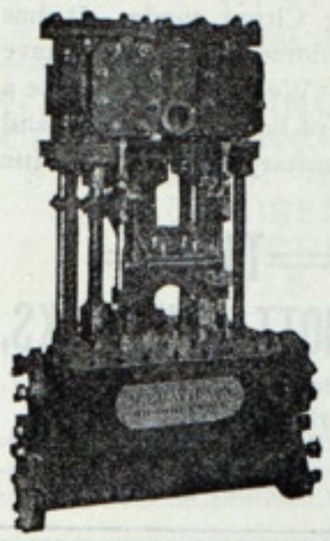

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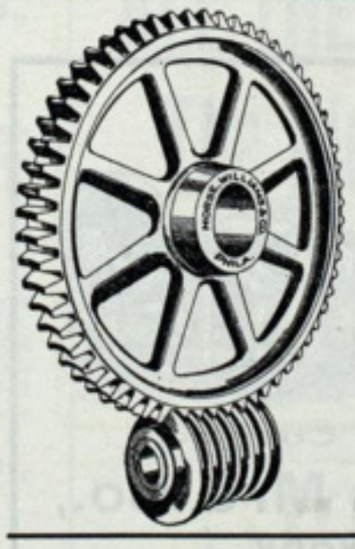

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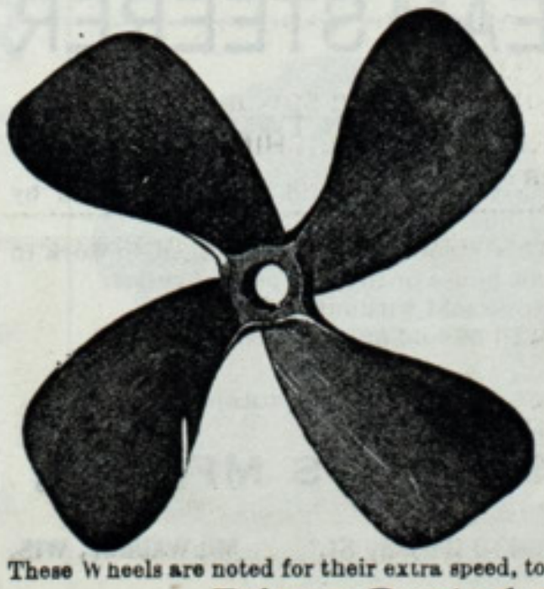

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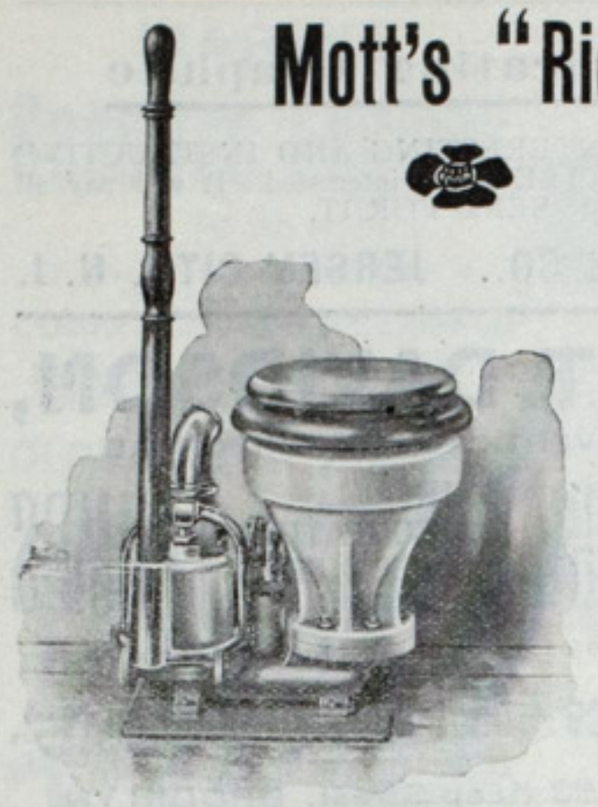

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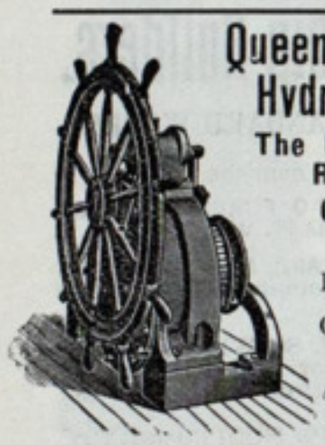

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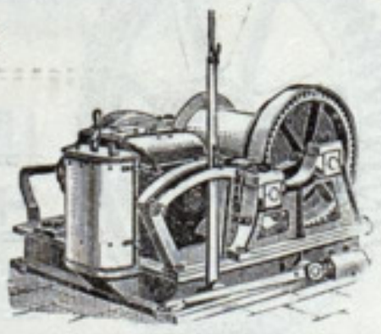

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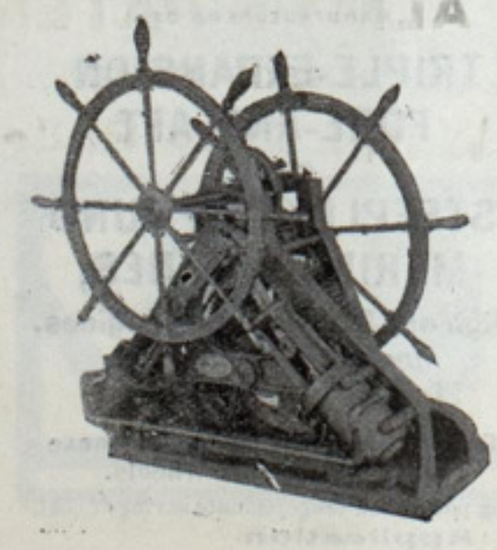

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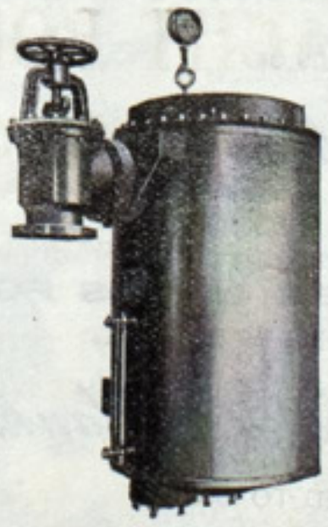

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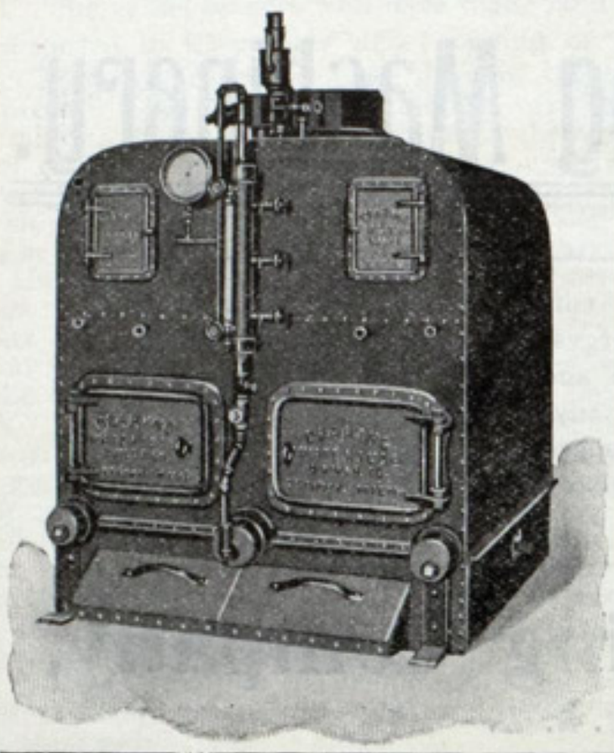

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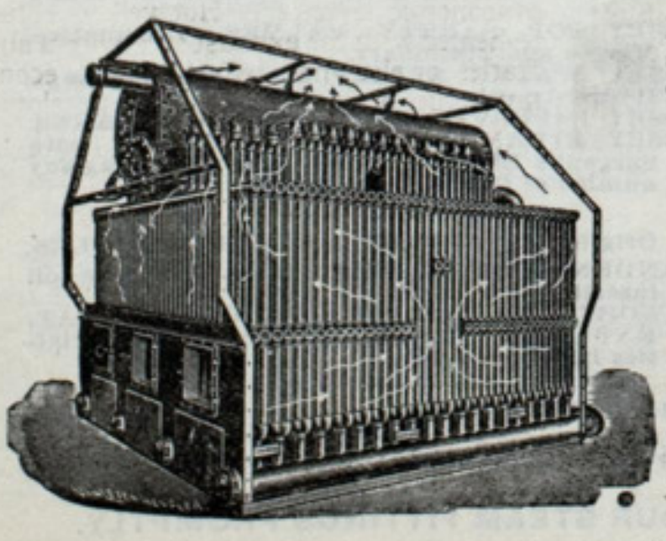

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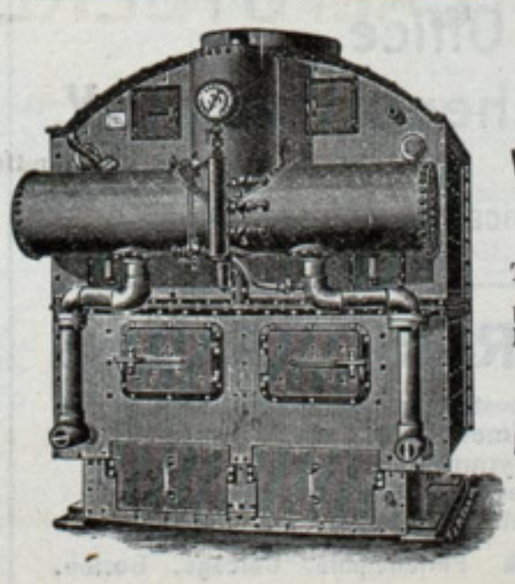

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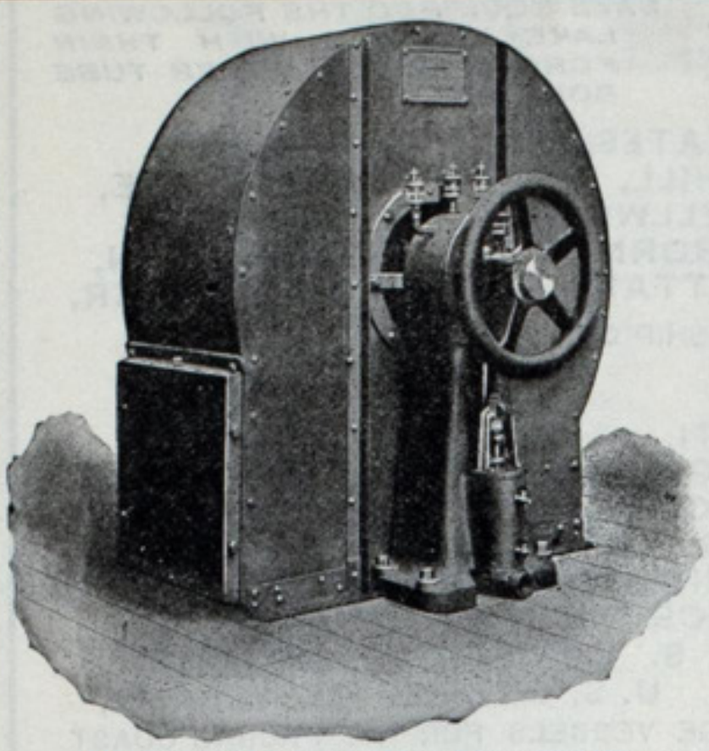

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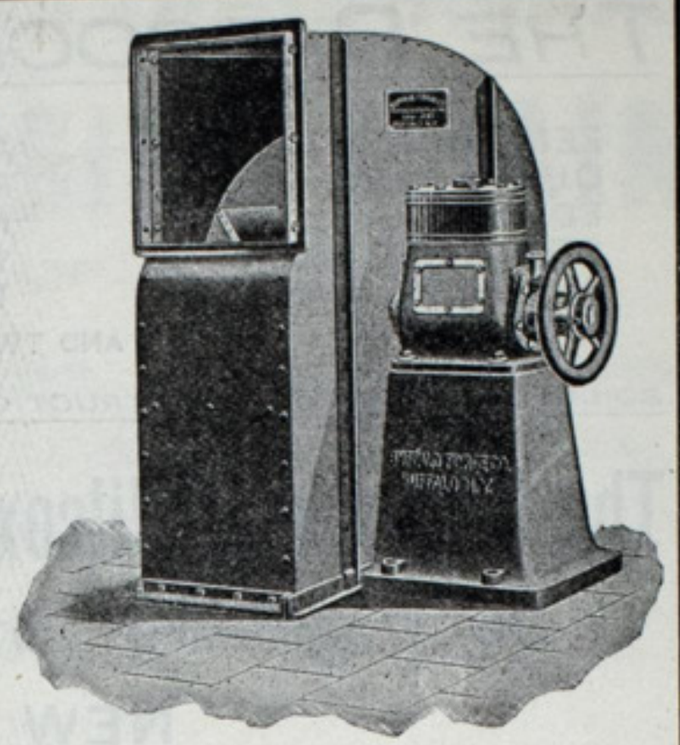

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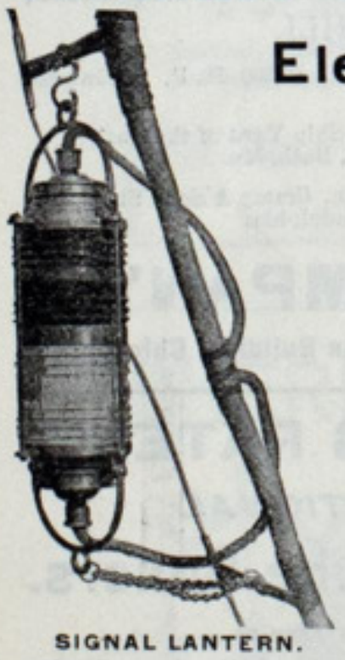

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